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Power Coaching

SPEED - II

QUESTION BANK FOR IITJEE

CHEMISTRY

QUEST TUTORIALS

QUEST TUTORIALS

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Power Coaching

QUEST TUTORIALS

TARGET IIT JEE

CHEMISTRY

ATOMIC STRUCTURE - I

ATOMIC MODELS

Q1. The space between proton and electron in hydrogen atom is :
(A) Absolutely empty (B) Full of electromagnetic radiation
(C) Full of air (D) Full of Ether

Q2. Nucleons are equal to :
(A) Number of electrons in an atom (B) Number of protons in the nucleus
(C) Number of neutrons in the nucelus (D) Number of protons and neutrons in the nucleus

Q3. Watermelon model of atom was proposed by:
(A) Rutherford (B) Thomson (C) Bohr (D) Sommerfeld

Q4. According to classical theory, the proposed circular path of an electron in Rutherford atomic model will be:
(A) Circular (B) Straight line (C) Parabolic (D) Spiral

Q5. Alpha-particle that come closer to nuclei:
(A) Are deflected more (B) Are deflected less
(C) Make more collisions (D) None

Q6. Positive charge in an atom is :
(A) scattered all over the atom (B) Concentrated in the nucleus
(C) Revolving around the nucleus (D) None is true

Q7. Which particle may be removed from a stable neutral atom with least energy change :
(A) An a – particle (B) A neutron (C) A proton (D) An electron

Q8. If each hydrogen atom is excited by giving 8.4 eV of energy then the number of spectral lines emitted is equal to:
(A) None (B) Two (C) Three (D) Four

Q9. Rutherford created a theoretical picture of the atom based on :
(A) Stars in galaxy (B) Model of planets revolving round the sun
(C) Behavior of waves in the ocean (D) Clouds in sky that move and mix in changing shapes

Q10. An atom is defined as :
(A) Largest particle of matter (B) Non-divisible particle
(C) The smallest particle of element (D) None

Q11. Many elements have non-integral atomic masses because :
(A) They have isotopes
(B) Their isotopes have non-integral masses
(C) Their isotopes have different masses
(D) The constituents neutrons, protons and electrons combine to give fractional masses

Q12. According to dalton's atomic theory, the smallest particle in which matter can exist, is called
(A) an atom (B) an ion (C) an electron (D) a molecule

Q13. According to dalton's atomic theory, an atom
(A) can not be subdivided (B) can be further subdivided
(C) contains neutrons, protons and electron (D) none of these

Q14. According to dalton's atomic theory, atoms of an element are
(A) similar in all respects except their masses (B) similar in all respects except their sizes
(C) identical (D) different

Q15. Which of the following is the correct statement for an electron
(A) electron is a particle having a negative charge of one unit and zero atomic mass
(B) electron is a particle having a positive charge of unit and zero atomic mass
(C) electron is a particle having a negative charge of one unit and a mass of about $9\times10^{-28}\,g$
(D) electron is a particle having a negative charge and a mass of about $1.7\times10^{-24}\,g$

Q16. Rutherford's experiment on scattering of α-particles showed for the time that the atom has
(A) electrons (B) protons (C) nucleus (D) neutrons

Q17. Rutherford's scattering experiment is related to the size of the
(A) nucleus (B) atom (C) electron (D) neutron

Q18. The element used by Rutherford in his famous scattering experiment was
(A) tin (B) gold (C) lead (D) silver

Q19. The proton and neutron are collectively called as
(A) deuteron (B) positron (C) meson (D) nucleon

Q20. The atomic weight of an element is 39. The number of neutrons in its nucleus is one more than the number of protons. The number of protons, neutrons and electrons respectively in its atom would be
(A) 19, 20 , 19 (B) 19,19, 20 (C) 20,19,19 (D) 20,19,20

Q21. Rutherford's experiment, which established the nuclear model of the atom, used a beam of
(A) β – particles, which impinged on a metal foil and got absorbed
(B) γ – rays, which impinged on a metal foil and ejected electrons
(C) helium atoms, which impinged on a metal foil and got scattered
(D) helium nucleus, which impinged on a metal foil and got scattered

Q22. Atomic number means
(A) number of protons (B) number of electrons (C) number of neutrons (D) number of nucleons

Q23. The number of electrons in one molecule of urea (NH_2CONH_2) is
(A) 20 (B) 22 (C) 28 (D) 32

Q24. The unit of atomic weight is
(A) gram (B) kg (C) gram per mole (D) cm^3

Q25. Atomic weight of an element is x. The actual mass of one atom of that element is
(A) x gram (B) x amu (C) $x\times6.023\times10^{23}\,amu$ (D) $\frac{x}{6.023\times10^{23}}\,amu$

Q26. The mass of one hydrogen atom is of the order of

(A) $10^{-23}\,kg$ (B) $10^{-24}\,kg$ (C) 10^{-28}Kg (D) $10^{-27}\,kg$

Q27. The number of electrons in 2.1 gram-ion of Cl^- is

(A) 2.1 (B) 2.1×18 (C) $2.1\times18\times6.023\times10^{23}$

(D) $2.1\times18\times6.023\times10^{23}$

Q28. If the mass table of atomic weights were established with oxygen atom assigned a value of 100, the atomic weight of carbon would be

(A)24 (B) 50 (C) 75 (D) 112

Q29. If the mass attributed to a neutron were halved and that attributed to the electron were doubled, the atomic mass of ${}_6C^{12}$ would

(A) remain approximately the same (B) be approximately doubled
(C) be approximately halved (D) be reduced approximately by 25%

Q30. When alpha particle are sent through a thin metal foil, most of them go straight through the foil because

(A) a-particles are much heavier than electrons (B) a- particles are positively charged
(C) most part of the atom is empty space (D) a-particle move with high velocity

Q31. Many atoms have non-integral atomic masses because

(A) they have isotopes (B) their isotopes have non-integral masses
(C) their isotopes have different masses
(D) the constituent neutrons, protons and electrons combine to give fractional masses

Q32. In the neutral state the element M consists of the isotopes ${}_{14}M^{28}, {}_{14}M^{29} and {}_{14}M^{30}$ in the ratio 60 : 30 : 20 respectively. Correct statements about M in the natural state include that

(A) the atomic weight is between 28.0 and 28.5
(B) atoms of M condition 24 electron each
(C) atoms of M may contain 14,15 or 16 neutrons each
(D) atoms of M contain 16 protons each

Q33. The nucleus and an atom can be assumed to be spherical .The radius of the nucleus of mass no. A is given by $1.25\times10^{-13}\times A^{1/3}$ cm. The atomic radius of atom is 1Å . If the mass no . is 64, the fraction of the atomic volume that is occupied by nucleus is :

(A) 1.0×10^{-3} (B) 5.0×10^{-5} (C) 2.5×10^{-2} (D) 1.25×10^{-13}

Q34 A: Atom is electrically neutral
R: A neutral particle, neutron is present in the nucleus of atom.
(A) If both assertion and reason are true and reason is the correct explanation of assertion
(B) If both assertion and reason are true but reason is not the correct explanation of assertion
(C) If assertion is true but reason is false (D) If both assertion and reason are false
(E) If assertion is false but reason is true

Q35. A: Thomson's atomic model is known as 'raisin pudding' model.
R: The aotm is visualized as a pudding of positive charge with electrons (raisins) embedded in it.
(A) If both assertion and reason are true and reason is the correct explanation of assertion
(B) If both assertion and reason are true but reason is not the correct explanation of assertion
(C) If assertion is true but reason is false (D) If both assertion and reason are false
(E) If assertion is false but reason is true

QUANTISATION

Q36. What is the value of azimuthal quantum number for 'g' sub shell?

Q37. Radius of the nucleus is equal to 10^{-12} cm. and that of the atom is equal to 10^{-8}cm. What is the fraction of the volume of the atom occupied by nucleus ?
(A) 10^{12} (B) 10^{-12} (C) 10^{-20} (D)10^{-4}

Q38. The core charge on oxygen is equal to -
(A) +2 (B) -2 (C) -6 (D) +6

Q39. The dual nature of photons is decribed by:
(A) Interference (B) $E = mc^2$ (C) Diffraction (D) E =hv

Q40. Light, a well-known from of energy, is treated as a from of matter, by saying that it consists of:
(A) Photons which are bundles of energy (B) Electrons or a wave like matter
(C) Neutrons, since electrically neutral (D) None

Q41. Which is not the property of the photons :
(A) Momentum (B) Energy (C) Velocity (D) Rest mass

Q42. A quanta will have more energy if :
(A) The wavelength is larger (B) The frequency is higher
(C) The amplitude is higher (D) The velocity is lower

Q43. The energy of electromagnetic radiation depends on :
(A) Amplitude and wavelength (B) Wavelength
(C) Amplitude (D) Temperature of medium through which it passes

Q44. Quantum theory was postulated by :
(A) Rutherford (B) Maxwell (C) Max Planck (D) Becquerel

Q45. The maximum wavelength of radiation that can ionise a sodium atom is 2414 A^0 . The ionisation energy of sodium per mole shall be
(A) $241.4 Jmol^{-1}$ (B) $497.7 Jmol^{-1}$ (C) $241.4 kJmol^{-1}$ (D) $497.7 kJmol^{-1}$

Q46. A: Electromagnetic radiations around 10^{15} Hz are called as visible light.
R: This is the only part of electromagentic radiation which is visible to eyes.
(A) If both assertion and reason are true and reason is the correct explanation of assertion
(B) If both assertion and reason are true but reason is not the correct explanation of assertion
(C) If assertion is true but reason is false
(D) If both assertion and reason are false
(E) If assertion is false but reason is true

Q47. A: VIBGYOR signifies the seven colour of visible light.
R: Red colour corresponds to higher frequency and blue colour to lower frequency region.
(A) If both assertion and reason are true and reason is the correct explanation of assertion
(B) If both assertion and reason are true but reason is not the correct explanation of assertion
(C) If assertion is true but reason is false
(D) If both assertion and reason are false
(E) If assertion is false but reason is true

Q48. A: The energy of quantum of radiation is given by $E = h\nu$.
R : Quantum in the energy equation signifies the principal quantum number.
(A) If both assertion and reason are true and reason is the correct explanation of assertion
(B) If both assertion and reason are true but reason is not the correct explanation of assertion
(C) If assertion is true but reason is false
(D) If both assertion and reason are false
(E) If assertion is false but reason is true

Q49. A: Energy of radiation is large if its wavelength is large.
R: Energy = $h\nu$ (ν = frequency, $\nu = c/\lambda$)
(A) If both assertion and reason are true and reason is the correct explanation of assertion
(B) If both assertion and reason are true but reason is not the correct explanation of assertion
(C) If assertion is true but reason is false
(D) If both assertion and reason are false
(E) If assertion is false but reason is true

BOHR

Q50. If the ionization potential of Li^{+2} is 122.4 eV. What is the 5th I.P. of carbon.

Q51. What is the wavelength of light required to raise an electron in the O^{7+} ion from n=1 to shell to n=2 shell.

Q52. What is the radius of Bohr's fifth orbit for B^{+4}.

Q53. If the potential energy of the electron is –10eV what is total energy?

Q54. First and second excitation potentials of hydrogen atom (in eV) would be respectively
(A) 10.2, 12.1 (B) 12.1, 10.2 (C) 13.6, 3.4 (D) 3.4, 13.6

Q55. The separation energy of the electron present in the shell n = 3 is 1.51 eV. What is the energy in the first exicted state ?
(A) -1.51eV (B) -3.4eV (C) +1.51 (D) +3.eV

Q56. The energy required for the ionization of excited hydrogen atom would be (in eV)-
(A) 13.6 (B) >13.6 (C) <13.6 (D) None of these

Q57. What is the potential energy of the electron in the L-shell of the hydrogen atom?
(A) -13.6eV (B) -6.8eV (C) -10.2eV (D) -3.4eV

Q58. For ionising an excited hydrogen atom, the required in eV will be-
(A) 3.4 or less (B) More than 13.6 (C) Little less than 13.6 (D) 13.6

Q59. If the electron jumps from 7.00eV energy level to 5.0eV energy level, it:
(A) Absorbs 2.0eV kinetic energy (B) Absorbs 2.0eV potential energy
(C) Emits 2.0eV electrical energy (D) Emits 2.0eV photon

Q60. Photon of the nmaximum frequeney will be absorbed in the transition (for H atom):
(A) From n = 1 to n = 4 (B) From n = 2 to n =1
(C) From n = 2 to n = 3 (D) From n = 3 to n = 2

Q61. Supposing the energy (in arbitrary units) of the energy levels in the hydrogen atom is given as under:

Energy level	K	L	M	N.....
	n =1	n = 2	n = 3	n = 4....n = ∞
Energy - 864 a.u.				Zero

the excitation energy needed to raise the electron from M level to n = ∞ would be :

(A) 192 (B) 96 (C) 188 (D) 384

Q62. Circumference of the first orbit of hydrogen atom is given by the formula:

(A) $\frac{22}{7}\alpha_0$ (B) $\frac{\pi\alpha_0}{2}$ (C) $\sqrt{4}\pi\alpha_0$ (D) $\pi\alpha_0$

Q63. When an electron moves from L-shell to M-shell, then it will be accompanied by:

(A) Energy absorption (B) Energy emission
(C) gamma-ray emission (D) gamma-ray absorption

Q64. When the electron passes from energy state nearest to the nucleus to third energy level, it will :

(A) Emit one quantum of energy (B) Absorb one quantum of energy
(C) Emit two quantum of energy (D) Absorb two quantum of energy

Q65. Evaluate the following ratios for the energy of the electron in a particular orbit :
[Kinetic : Potential] and [Total : Kinetic]

(A) [1 : -2] and [-1 : 1]
(B) [1 : 2] and [1 : 1]
(C) [1 : 1] and [1 : 2]
(D) [1 : 2] and [1 : 2]

Q66. If the I.E. of He^+ us 54.4eV then -

(A) I.E.of H is 13.6eV and that of Li^{+2} 122.4eV
(B) I.E.of H is 13.6eV and that of Li^{+2} cannot be determined
(C) I.E.of H is 13.6eV and that of Li^{+2} is 27.2eV
(D) All of the above are wrong

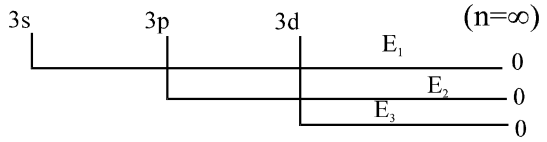
Q67. Which particle can not be accelerated

(A) α-particle (B) Electron (C) Neutron (D) Proton

Q68. Supposing the electron of the H-atom is present in the L-shell. If it liberates 10.2eV, what is the energy of the system ?

(A) -3.4eV (B) -13.6eV (C) -10.2eV (D) 0eV

Q69. For H-atom, the energy required for the removal of electron from various sub-shells is given as under:



The order of the energies would be :

(A) $E_1 > E_2 > E_3$ (B) $E_3 > E_2 > E_1$ (C) $E_1 = E_2 = E_3$ (D) None of these

Q70. Going from K-shell to N-shell in case of H-atom :

(A) K.E. decreases (B) Total energy decreases
(C) Potential energy decreases (D) None of the above

Q71. What is the radius ratio for 2nd orbit of Li^{+2} ion 3rd orbit of Be^{+3} ion ?
(A) 3 : 1 (B) 16 : 27 (C) 4 : 9 (D) 3 : 4

Q72. The ratio of the energy of the electrons in ground state of hydrogen to the electrons in first excited state of Be^{3+} is :
(A) 1:4 (B) 1:8 (C) 1:16 (D) 16:1.

Q73. Normally, the time taken in the transition is :
(A) Zero (B) 1 (C) 10^{-5} sec (D) 10^{-8} sec

Q74. The total energy of an atomic electron is :
(A) Zero (B) Less than zero (C) More than zero
(D) Sometimes more and sometimes less than zero

Q75. The expression Ze gives :
(A) The charge of α – particle (B) The charge on an atom
(C) The charge on the nucleus of atomic number Z
(D) The kinetic energy of an α – particle

Q76. The energy of the electron at infinite distance from the nucleus in Bohr's model is taken as :
(A) Zero (B) Positive (C) Negative (D) Any value

Q77. As an electron is brought from an infinite distance close to the nucleus of the atom, the energy of the electron-nucleus system :
(A) Increases to a greater positive value (B) Decreases to a smaller positive value
(C) Decreases to a smaller negative value (D) Increases to a smaller negative value

Q78. The energy of an electron in the first Bohr's orbit of H atom is -13.6eV. The possible energy value (s) of the excited state (s) for electron in Bohr's orbits of hydrogen is (are) :
(A) -3.4eV (B) -4.2eV (C) -6.8eV (D) +6.8eV

Q79. Which electron transition in a hydrogen atom requires the largest amount of energy :
(A) From $n=1$ to $n=2$ (B) From $n=2$ to $n=3$
(C) From $n=\infty$ to $n=1$ (D) From $n=3$ to $n=5$

Q80. Bohr's model of atom explains :
(A) Zeeman effect (B) Heisenberg's principle (C) Strak effect (D) None of these

Q81. Bohr's atomic theory gave the idea of :
(A) Quantum numbers (B) Shape of sublevels (C) Nucleus (D) Stationary states

Q82. The ionzation potential of hydrogen atom is 13.6 eV. The energy required to remove an electron from the n = 2 state of hydrogen atom is :
(A) 27.2 eV (B) 13.6 eV (C) 6.8eV (D) 3.4 eV

Q83. The total energy of the electron in the hydrogen atom in the ground state is -13.6 eV. What is the stopping potential :
(A) 13.6 volts (B) Zero (C) -13.6 volts (D) 6.8 volts

Q84. In an atom two electrons move around the nucleus in circular orbits of radii R & 4R. The ratio of the time taken by them to complete one revolution is :
(A) 1 : 4 (B) 4 : 1 (C) 1 : 8 (D) 8 : 7

Q85. Ionisation of H–atom would produce
(A) hydride ion (B) hydronium ion (C) proton (D) hydroxyl ion

Q86. The radius of an atom is of the order of
(A) $10^{-10}\,cm$ (B) $10^{-12}\,cm$ (C) $10^{-15}\,cm$ (D) $10^{-8}\,cm$

Q87. The radium of an atom is about
(A) the same as the volume of its nucleus (B) four times the radius of its nucleus
(C) 10,000 times the radius its nucleus (D) 10^{12} times the radius of its nucleus

Q88.
(i) Calculate the radius of first Bohr orbit of hydrogen atom
(ii) Calculate the velocity of an electron in the ground state of hydrogen atom.
(iii) What fraction of the velocity of light is the velocity of an the ground state of hydrogen atom ?
(iv) How long does an electron takes to complete one revolution around the nucleus in first Bohr orbit of hydrogen atom ?
(v) How many times in one second does an electron travel around the nucleus in first Bohr orbit of hydrogen?

Q89. Bohr's model can not explain the emission spectrum of
(A) H (B) He^{+} (C) Li^{2+} (D) Na

Q90. Angular momentum of an electron in the n^{th} orbit of hydrogen atom is given by
(A) $\frac{2\prod}{nh}$ (B) $\frac{\prod}{2nh}$ (C) $\frac{nh}{2\prod}$ (D) nh

Q91. The maximum energy is possessed by an electrons, when it is present
(A) in nucleus (B) in ground energy state
(C) in first excited state (D) at infinite distance from the nucleus

Q92. As we move away from the nucleus, the energy of the electron
(A) decreases (B) remains the same (C) increases (D) first decreases then increases

Q93. Which of the following electronic transitions in a hydrogen atom will require the largest amount of energy
(A) from n= 1 to n=2 (B) from n = 2 to n = 3
(C) from n = ∞ to n = 1 (D) from n = 3 to n = 5

Q94. In Bohr's model of atom when an electron jumps from n =1 to n=3, how much energy will be absorbed
(A) $2.15\times10^{-10}\,ergs$ (B) 0.1911 x 10^{-10}ergs (C) 2.389 x 10^{-10}ergs (D) 0.239 x 10^{-10}ergs

Q95. If energy of the electron in hydrogen atom in some excited state is -3.4eV, then what will be its angular momentum
(A) $1.8\times10^{-30}\,kgm^2s^{-1}$ (B) $2.1\times10^{-34}\,kgm^2s^{-1}$
(C) $9.2\times10^{-37}\,kgm^2s^{-1}$ (D) $1.2\times10^{-32}\,kgm^2s^{-1}$

Q96. Potential energy of an electron in the atom is

(A) Ze^2/r (B) $-Ze^2/r$ (C) Ze^2/r^2 (D) $-Ze^2/r^2$

Q97. Electrostatic force of attraction between electron and the nucleus in the hydrogen atom is

(A) $\frac{e^2}{r}$ (B) $\frac{e^2}{r^2}$ (C) $\frac{e^2}{2r^2}$ (D) $\frac{Ze^2}{r}$

Q98. Which one of the following is incorrect for the Bohr model of hydrogen atom

(A) $\frac{Ze^2}{r^2}=\frac{mv^2}{r}$ (B) angular momentum is quantized

(C) mass of proton is ignored (D) none of the above

Q99. In which orbit of the Bohr model of the hydrogen atom is the speed of electron maximum

(A) $n=2$ (B) n = 1 (C) $n=3$ (D) $n=4$

Q100. The mass of the proton is 1840 times that of electron. If a proton is accelerated through a potential difference of V volts, the kinetic energy of the proton would be

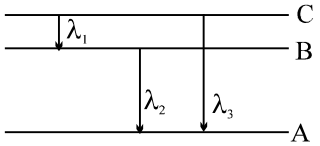
(A) 1 e V (B) 1keV (C) 1840 eV (D) 1849 keV

Q101. With increasing principle quantum number, the energy difference between adjacent energy levels in H atom

(A) increases (B) decreases

(C) decreases for low value of Z and increases for high value of Z (D) remains constant

Q102. Energy levels A, B, C of a certain atom corresponds to increasing values of energy, *i.e.*, $E_A < E_{B<}E_C$. If $\lambda_1, \lambda_2 and \lambda_3$ are the wavelength of radiations corresponding to the transitions C to B, B to A and C to A respectively, which of the following statement is correct :



(A) $\lambda_3 = \lambda_1 + \lambda_2$ (B) $\lambda_3 = \frac{\lambda_1\lambda_2}{\lambda_1+\lambda_2}$ (C) $\lambda_1+\lambda_2+\lambda_3=0$ (D) $\lambda_3^2=\lambda_1^2+\lambda_2^2$

Q103. Binding energy of hydrogen atom is 13.6 eV . The binding energy of a singly ionized helium atom is :

(A) 13.6 eV (B) 27.2 eV (C) 54.4 eV (D) 3.4 eV

Q104. The ionization potential of sodium is 5.48 eV. The I.P. of potassium is

(A) Equal to that of sodium (B) 5.68 eV

(C) 4.68 eV (D) 10.88 eV

Q105. A: The radius of the first orbit of hydrogen atom is 0.529Å.

R: Radius for each circular orbit (r_n) = 0.529Å (n^2/Z), where n = 1, 2, 3 and Z = atomic number.

(A) If both assertion and reason are true and reason is the correct explanation of assertion

(B) If both assertion and reason are true but reason is not the correct explanation of assertion

(C) If assertion is true but reason is false

(D) If both assertion and reason are false

(E) If assertion is false but reason is true

Q106. A: The transition of electrons $n_3 \rightarrow n_2$ in H atom will emit greater energy than $n_4 \rightarrow n_3$.
R: n_3 and n_2 are closer to nucleus than n_4.
(A) If both assertion and reason are true and reason is the correct explanation of assertion
(B) If both assertion and reason are true but reason is not the correct explanation of assertion
(C) If assertion is true but reason is false
(D) If both assertion and reason are false
(E) If assertion is false but reason is true

Q107. A: In H atom when electrons jump from 1s to 2s orbital, atom becomes cation.
R: H atom has only one electron.
(A) If both assertion and reason are true and reason is the correct explanation of assertion
(B) If both assertion and reason are true but reason is not the correct explanation of assertion
(C) If assertion is true but reason is false
(D) If both assertion and reason are false
(E) If assertion is false but reason is true

Q108. A: The spectrum of He^+ is expected to be similar to that of hydrogen.
R: He^+ is also an one electron system.
(A) If both assertion and reason are true and reason is the correct explanation of assertion
(B) If both assertion and reason are true but reason is not the correct explanation of assertion
(C) If assertion is true but reason is false
(D) If both assertion and reason are false
(E) If assertion is false but reason is true

ANSWERS

ATOMIC MODELS

Q1. A	Q2. D	Q3. B	Q4. D	Q5. A	Q6. B	Q7. D
Q8. A	Q9. B	Q10. C	Q11. D	Q12. A	Q13. A	Q14. C
Q15. C	Q16. C	Q17. A	Q18. B	Q19. D	Q20. A	Q21. D
Q22. A	Q23. D	Q24. C	Q25. B	Q26. D	Q27. C	Q28. C
Q29. D	Q30. C	Q31. ABCD	Q32. C	Q33. D	Q34 B	Q35. A

QUANTISATION

Q37. B	Q38. D	Q39. D	Q40. A	Q41. D	Q42. B	Q43. B
Q44. C	Q45. D	Q46. A	Q47. C	Q48. C	Q49. E	

BOHR

Q50. 489.6 V	Q51. 1.9 nm	Q52. 2.645 Å	Q53. –5eV	Q54. A	Q55. B	Q56. C
Q57. B	Q58. A	Q59. D	Q60. A	Q61. B	Q62. C	Q63. A
Q64. B	Q65. A	Q66. A	Q67. C	Q68. B	Q69. C	Q70. A
Q71. B	Q72. A	Q73. D	Q74. B	Q75. C	Q76. A	Q77. C
Q78. A	Q79. A	Q80. D	Q81. D	Q82. D	Q83. A	Q84. C
Q85. C	Q86. D	Q87. C				

Q88.(i) 0.5Å; (ii) 2.188×10^8cm/sec. (iii) 7.29×10^{-3}; (iv) 1.528×10^{-16} sec.; (v) 6.54×10^{15}sec^{-1}

Q89. D	Q90. C	Q91. D	Q92. C	Q93. A	Q94. B	Q95. B
Q96. B	Q97. B	Q98. D	Q99. B	Q100. A	Q101. B	Q102. B
Q103. C	Q104. C	Q105. A	Q106. B	Q107. E	Q108. A	

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PHYSICAL CHEMISTRY

ATOMIC STRUCTURE - II

Q1. What transition in the hydrogen spectrum have the same wavelength as Balmer transition, n=4 to n= 2 of He^+ spectrum?

Q2. In case of hydrogen atom when electron falls from higher level to M shell, the corresponding spectral line will form the part of :
(A) Balmer series(B) Lyman series (C) Paschen series (D) Pfund series

Q3. Which of the following statement is incorrect ?
(A) The third quantum shell can hold a maximum of 18 electrons
(B) An electron falling to the same energy level from any higher level always emits the same quantum of energy
(C) The Balmer series of lines is in the visible region of the emission spectrum of hydrogen atom
(D) The electron of hydrogen atom in its ground state remains in the first quantum shell

Q4. Total number of spectral lines when electron jumps from 8th orbit to 2nd orbit:
(A) 6 (B) 36 (C) 21 (D) 38

Q5. Supposing the electron is present in the 4th energy level of H- atom. When the electron returns to ground state the possible transitions would be :
(A) $4 \longrightarrow 1$ (B) $4 \longrightarrow 2,\ 2 \longrightarrow 1$ (C) $4 \longrightarrow 3,\ 3 \longrightarrow 2,\ 2 \longrightarrow 1$ (D) All the above

Q6. The radiation is emitted when a hydrogen atom goes from a high energy state to a lower energy state. The wavelength of one line in visible region of atomic spectrum of hydrogen is 6.5×10^{-7} m. Energy difference between the two states is:
(A) $3.0\times10^{-19}\,J$ (B) $1.0\times10^{-18}\,J$ (C) $5.0\times10^{-10}\,J$ (D) $6.5\times10^{-7}\,J.$

Q7. Ritz combination principle is :
(A) $v^{-} = R_H(z^2)\left[\frac{1}{n^2_1} - \frac{1}{n_2^{\ 2}}\right]$ (B) $E_n = \frac{-2\prod^2 mz^2e^4}{h^2}$
(C) $E = \frac{hc}{\lambda}$ (D) none

Q8. The wavelength of a spectral line for an electronic transition is inversely related to :
(A) the number of orbital undergoing the transition.
(B) the nuclear charge of an atom
(C) the difference in energy levels involved in the transition.
(D) the velocity of the electron undergoing the transition.

Q9. The hydrogen spectrum from an incadescent source of hydrogen is :
(A) A band spectrum in emission (B) A line spectrum in emission
(C) A band spectrum in absorption (D) A line spectrum in absorption

Q10. Which statement relating to the spectrum of H atom is false:
(A) The lines can be defined by quantum number
(B) The lines of longest wavelength in the Balmer series corresponds to the transition between n-3 and n=2 levels
(C) The spectral lines are closer together at longer wavelength
(D) A continuum occurs at $n = \infty$

Q11. Fill in the blanks :

(i) The light radiations with discrete quantities of energy are called ..... . (I.I.T. 1993)

(ii) $h/\prod$ is the angular momentum of the electron in the .....orbit of He^+. (R.E.E. 1990)

(iii) The transition of the electron in hydrogen atom from fourth to the first energy state emits a spectral line which falls in ..... series. (R.E.E. 1990)

Q12. The observation of line spectrum of hydrogen atom indicates that
(A) the electrons do not lose energy when in stationary states
(B) there is emission of energy when a sample of hydrogen is heated
(C) an electron in excited state loss energy continuously
(D) an electron in excited state loses energy in the form of bundles or packets of energy

Q13. Lines of Lyman series of spectrum of hydrogen are in
(A) ultraviolet region (B) infrared region
(C) visible region (D) far infrared region (E) none of the above

Q14. When the electron of hydrogen atom return to L shell from shells of higher energy, we get a series of lines in the spectrum. This series is called
(A) Balmer series(B) Lyman series (C) Brackett series (D) Paschen series

Q15. In hydrogen atoms electrons are excited to the 5th quantum level. How many different lines may appear in the spectrum
(A) 4 (B) 12 (C) 8 (D) 10

Q16. A certain transition in the hydrogen spectrum from an excited state in one or more steps gives rise to a total of ten lines. Number of lines lying in visible spectrum is
(A) 3 (B) 4 (C) 5 (D) 6

Q17. The wave number of the first Lyman transition in H atom spectrum is equal to the wave number of second balmer transition in the spectrum of
(A) Li^{2+} (B) Be^{3+} (C) He^{+} (D) B^{4+}

Q18. In Bohr series of lines of hydrogen spectrum, the third line from the red end corresponds to which one of the following inter-orbit in an atom of hydrogen
(A) $4 \rightarrow 1$ (B) $2 \rightarrow 5$ (C) $3 \rightarrow 2$ (D) $5 \rightarrow 2$

Q19. The wavelength of the radiation emitted, when in a hydrogen atom electron falls from infinity to stationary state 1, would be (Rydberg constant = $1.097 \times 10^{7} m^{-1}$)
(A) 406nm (B)192 nm (C) 91 nm (D) $9.1 \times 10^{-8} nm$

Q20. A certain atomic transition from an excited state to the ground state of the hydrogen atom in one or more steps give rise to four line in the ultraviolet region of the spectrum. How many lines does this transition produce in the infrared region of the spectrum
(A) 1 (B) 2 (C) 3 (D) 6

Q21. The masses of photons corresponding to the first lines of Lyman and Balmer series of the spectrum of hydrogen atom are in the ratio of
(A) 27 : 5 (B) 3 : 2 (C) 2 : 3 (D) 4 : 9

Q22. If the series limit of wavelength of the Lyman series for the hydrogen atom is 912Å, then the series limit of wavelength for the Balmer series of radiation which may be emitted is :
(A) 912 Å (B) 912× 2 Å (C) 912× 4Å (D) 912/2 Å

Q23. What transition in He^{+} ion shall have the same wave number as the first line in Balmer series of hydrogen atom :
(A) $3 \rightarrow 2$ (B) $6 \rightarrow 4$ (C) $5 \rightarrow 3$ (D) $7 \rightarrow 5$

Q24. An atom emits energy equal to 4×10^{-12} erg .To which part of electromagnetic spectrum it belongs :
(A) UV region (B) Visible region (C) IR region (D) Microwave region

Q25. A metal surface emits photo electrons, when the incident radiation possesses minimum.....
(A) Frequency (B) Intensity (C) Velocity (D) Wave-length

Q26. Electromagnetic radiatiations of frequency 'v' consists of a stream of particles called photons. Which of the following statements is / are true about photons :
(A) as the frequency increases, the number of photons in the beam increases.
(B) as the intensity of light increases ' the number of photons in the beam increases.

(C) the number of photons in the beam are independent of frequency
(D) the number of photons in the beam are independent of the intensity of light.

Q27. In photoelectric effect, the saturation photocurrent:
(A) Increases with increase of frequency of incident photon
(B) Decreases with increase of frequency of incident photon
(C) Does not depend on the frequency of photon but depends only on intensity of incident light
(D) Depends both on intensity and frequency of the incident Photon

Q28. A photon-sensitive metal is not emitting photoelectron when irradiated. It will do so when threshold is crossed. To cross the threshold we need to increase:
(A) Intensity (B) Frequency (C) Wavelength (D) none

Q29. The photoelectric effect is described as the ejection of electrons from the surface of a metal when :
(A) It is heated to a high temperature (B) Electrons of suitable velocity impinge on it
(C) Light of suitable wavelength falls on it (D) It is placed in a strong magnetic field

Q30. Photoelectric effect shows :
(A) Particle-like behavior of light (B) Wave-like behavior of light
(C) Both wave-like and particle-like behavior of light
(D) Neither wave-like nor particle-like behavior of light

Q31. The photoelectric effect occurs only when the incident light has more frequency than a certain minium:
(A) Frequency (B) Wavelength (C) Speed (D) Charge

Q32. When the frequency of light incident on a metallic plate is double, the KE of the emitted photoelectrons will be :
(A) Doubled
(B) Halved
(C) Increased but more than doubled of the previous KE
(D) Unchanged

Q33. A surface ejects electrons when hitted by green light but not. When hitted by yellow light. Will electrons be ejected if the surface is hitted by red light:
(A) Yes
(B) No
(C) Yes, if the red beam is quite intense
(D) Yes, if the red beam continues to fall upon the surface for a long time

Q34. The work function for a metal is 4 eV. To emit a photo electron of zero velocity from the surface of the metal, the wavelength of incident light should be :
(A) 2700Å (B) 1700 Å (C) 5900 Å (D) 3100 Å

Q35. Photoelectric effect is the phenomenon in which
(A) Photons come out of a metal when it is hit by a beam of electrons.
(B) Photons come out of the nuclues of an atom under the action of an electric field
(C) Electrons come out of a metal with a constant velocity which depends on the frequency and intensity of incident light wave.
(D) Electrons come out of a metal with different velocities not greater than a certain value which depends only on the frequency of the incident light wave and not on its intensity.

Q36. In photoelectric effect, the photocurrent
(A) Increases with increasing frequency of incident photon.
(B) Decreases with increasing frequency of incident photon
(C) Does not depend on the frequency of photon
(D) Depends both on intensity and frequency of the incident photon

Q37. Photoelectric effect can be caused by
(A) visible light but not X-rays (B) Gamma rays but not by X-rays
(C) U.V. light only (D) Visible light, U.V. rays and Gamma rays also

Q38. Photoelectric effect shows
(A) Particle nature of light (B) wave nature of light
(C) dual nature of light (D) neither of the natures of light

Q39. When light is directed at the metal surface, the emitted electrons
(A) are called photons
(B) have random energies
(C) have energies that depend upon the frequency of light
(D) have energies that depend upon the intensity of light
(E) have energies less than the energy of incident photons

Q40. If λ_L, λ_m and λ_N are the wave lengths of electron in L, M, N energy levels of H-atom respectively. What is their decreasing order:
(A) $\lambda_L > \lambda_M > \lambda_N$ (B) $\lambda_L < \lambda_M < \lambda_N$ (C) $\lambda_L > \lambda_M < \lambda_N$ (D) $\lambda_L < \lambda_M > \lambda_N$

Q41. The wave- length of a moving electron-
(A) Increases with the increase of the velocity of the electron
(B) Does not depend upon the velocity of the electron
(C) Decreases with the increase of velocity of the electron
(D) Is equal to zero

Q42. How fast is an electron moving if it has a wavelength equal to the distance it travels in one second?
(A) $\sqrt{\frac{h}{m}}$ (B) $\sqrt{\frac{m}{h}}$ (C) $\sqrt{\frac{h}{p}}$ (D) $\sqrt{\frac{h}{2(KE)}}$

Q43. If travelling at equal speeds, the longest wavelength of the following matter waves is that for a:
(A) electron (B) proton (C) neutron (D) alpha particle (He^{2+}).

Q44. The Heisenberg's uncertainty principle can be applied to :
(A) A cricket ball (B) A football (C) A jet aeroplane (D) An electron

Q45. The de Broglie wavelength of a tennis ball of 60 g moving with a velocity of 10 meters per second is approximately
(A) 10^{-16}meters (B) 10^{-25}meters (C) 10^{-33}meters (D) 10^{-31}meters

Q46. It is not true that
(A) The wavelength associated with an electron is longer that of proton if they have the same speed
(B) violet radiations have a longer wavelength that red radiations
(C) the energy of light with wavelength 600 nm is lower than with wavelength 500 nm
(D) spectrum of an atom is known as line spectrum

Q47. The condition for a stable wave is
(A) $n\lambda = 6\prod r$ (B) $n\lambda = \frac{1}{2}\prod r$ (C) $n\lambda = 8\prod r$ (D) $n\lambda = 4\prod r$

Q48. Number of waves formed by a Bohr electron in one complete revolution in its third orbit is
(A) 0 (B) 1 (C) 2 (D) 3

Q49. Bohr model of atom is contradicted by
(A) Pauli's exclusion principle (B) Plank quantum theory
(C) Heisenberg uncertainty principle (D) all the above

Q50. Heisenberg uncertainty principle is not valid for:
(A) Moving electrons (B) Motor car (C) Stationary particles (D) All

Q51. What accelerating potential must be imparted to a proton beam to give it an effective $\lambda = 0.05$ Å.
(V=33 volt) ($m_p = 1.672 \times 10^{-27}$kg)

Q52. Calculate the λ associated with an electron moving with the velocity of light.

Q53. The K.E. of an electron is 4.55×10^{-25}J Calculate its λ.

Q54. Calculate the λ of CO_2 molecule moving with a velocity 440 m/s.

Q55. Show that the De-Broglie λ of the electron in nth Bohr orbit is proportional to n (no. of orbit)

Q56. The De-broglie λ of electron in the 2st Bohr orbit is
(A) πr_1 (B) $4\pi r_1$ (C) $2\pi r_1$ (D) $6\pi r_1$

For Assertion–Reason type questions
(A) If both assertion and reason are true and reason is the correct explanation of assertion
(B) If both assertion and reason are true but reason is not the correct explanation of assertion
(C) If assertion is true but reason is false
(D) If both assertion and reason are false
(E) If assertion is false but reason is true

Q57. *Assertion :* Hydrogen has only electron in its orbit but it produces several lines.
*Reason :*There are many excited energy levels available.

Q58. *Assertion:* Line emission spectra hels in the study of electronic spectra.
Reason: Each element has a unique line emission spectrum.

Q59. *Assertion:* On increasing the intensity of incident radiation, the number of photoelectrons ejected and their K.E. increase.
Reason: Greater the intensity means greater the total energy

Q60. *Assertion:* Electron are ejected from a certain metal when either blue or violet light strikes the metal surface. However, only violet light causes electron ejection from a second metal.
*Reason :*The electron in the first metal require less energy for ejection.

Q61. *Assertion:* The kinetic energy of the photoelectron ejected increases with increase in intensity of incident light.
Reason: Increase in intensity of incident light increase the rate of emission

Q62. *Assertion:* Threshold frequency is a characterstic for a metal.
Reason: Threshold frequency is a maximum freuency required for the ejection of electron fom the metal surface.

Q63. *Assertion:* Matter waves consist of oscillating electric and magnetic fields.
Reason: Matter waves require medium for propagation.

ANSWERS:

Q1.	$2 \rightarrow 1$	Q2.	C	Q3.	B	Q4.	C	Q5.	D
Q6.	A	Q7.	A	Q8.	B	Q9.	B	Q10.	C
Q11.	(i) quanta (ii) IInd (iii) Lyman			Q12.	D	Q13.	A	Q14.	A
Q15.	D	Q16.	A	Q17.	C	Q18.	D	Q19.	C
Q20.	C	Q21.	A	Q22.	C	Q23.	B	Q24.	B
Q25.	A	Q26.	BC	Q27.	C	Q28.	B	Q29.	C
Q30.	A	Q31.	A	Q32.	C	Q33.	B	Q34.	D
Q35.	D	Q36.	C	Q37.	D	Q38.	A	Q39.	CE
Q40.	B	Q41.	C	Q42.	A	Q43.	A	Q44.	D
Q45.	C	Q46.	B	Q47.	C	Q48.	D	Q49.	C
Q50.	BC	Q52.	2.5×10^{-12}m	Q53.	97.2×10^{-7} m	Q54.	$\lambda = 2.06 \times 10^{-11}$	Q56.	B
Q57.	A	Q58.	A	Q59.	D	Q60.	A	Q61.	E
Q62.	C	Q63.	E						

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PHYSICAL CHEMISTRY

ATOMIC STRUCTURE - III

Q1. Deduce the possible sets of four quantum number when n = 2.

Q2. What is the maximum number of electron that may be present in all the atomic orbitals with principal quantum number 3 and azimuthal quantum number 2 ?

Q3. How many electron in an atom can have the following sets of quantum number ?

(i) $n = 3$ (ii) $n = 2, l = 0$ (iii) $n = 2, l = 2$ (iv) $n = 2, l = 0, m = 0, s = +\frac{1}{2}$

Q4. Although no currently known element contains electrons in g orbitals in the ground state, it is possible that such element will be found or that electrons in excited states of known elements could be in g orbitals. For g orbitals, l = 4. What is the lowest value of n for which g orbitals could exist? What are the possible values of m? How many electrons could a set of g orbitals hold?

Q5. Arrange the electrons represented by the following sets of quantum numbers in the decreasing order of energy. (R.E.E. 1987)

(i) $n = 4, l = 0, m_l = 0, m_s = +\frac{1}{2}$ (ii) $n = 3, l = 1, m_l = 1, m_s = -\frac{1}{2}$

(iii) $n = 3, l = 2, m_l = 0, m_s = +\frac{1}{2}$ (iv) $n = 3, l = 0, m_l = 0, m_s = -\frac{1}{2}$

Note : Magnetic and spin quantum numbers are denoted by m_l and m_s respectively in this question

Q6. Maximum number of unpaired electrons which can be acommodated in the sub-shell: s, p, d, f, g is____

Q7. Which of the following orbitals has a dumbbell shape
(A) s (B) p (C) d (D) f

Q8. Which of the following orbitals is non-directional
(A) s (B) p (C) d (D) f

Q9. Which of the following quantum number is not obtained by the solution of Schrodinger wave equation
(A) magnetic quantum number (B) principal quantum number
(C) spin quantum number (D) azimuthal quantum number

Q10. Principal, azimuthal and magnetic quantum numbers are respectively related to
(A) size, shape and orientation (B) shape, size and orientation
(C) size, orientation and shape (D) none of these

Q11. Degenerate atomic orbital have
(A) equal energy (B) nearly equal energy
(C) different energy (D) none of above

Q12. The orbital occupied by an electron with quantum numbers $n = 4, l = 3, m = 0 and s = -\frac{1}{2}$ is called

(A) 1s subshell (B) 4d orbital
(C) 4f subshell (D) 3s subshell

Q13. Which of the following sets of quantum number is not possible

(A) $n = 2, l = 1, m = -1, s = -1/2$ (B) $n = 3, l = 2, m = -3, s = +1/2$

(C) $n = 2, l = 0, m = 0, s = +1/2$ (D) $n = 3, l = 2, m = -2, s = +1/2$

Q14. Which of the following sets of quantum number is not correct

(A) $n = 2, l = 0, m = 0, s = +\frac{1}{2}$ (B) $n = 4, l = 3, m = +2, s = +\frac{1}{2}$

(C) $n = 2, l = 2, m = 0, s = -\frac{1}{2}$ (D) all of these

Q15. Which is correctly matched

(A) $n=5, l=2, m=+2, s=-1/2$ (B) $n=5, l=5, m=-2, s=+1/2$

(C) $n=3, l=2, m=+2, s=0$ (D) $n=3, l=2, m=+3, s=+1/2$

Q16. Which of the following sets of quantum numbers is correct for an electron in 4f orbital

(A) $n=4, l=3, m=+1, s=+\frac{1}{2}$ (B) $n=4, l=4, m=-4, s=-\frac{1}{2}$

(C) $n=4, l=3, m=+4, s=+\frac{1}{2}$ (D) $n=3, l=2, m=-2, s=+\frac{1}{2}$

Q17. In the n th quantum level, the number of electronic subshell is

(A) n (B) $2n^2$ (C) $2n$ (D) $2\times(2l+1)$

Q18. For the energy level with the principal quantum number 3, the number of possible orbitals is

(A) 1 (B) 4 (C) 3 (D) 9

Q19. For electrons having principal quantum number are 3, the number of (i) subshells and (ii) orbitals would be respectively

(A) 3 and 5 (B) 3 and 7 (C) 3 and 9 (D) 2 and 5

Q20. The magnetic quantum number m_l is fixed by the azimuthal quantum number, l. If $l=2,$ the type and number of the orbitals indicated by

(A) f, 7 (B) d, 5 (C) p, 3 (D) s, 1

Q21. The electrons, identified by quantum by numbers n and l, (i) $n=4, l=1$ (ii) $n=4, l=0$ (iii) $n=3, l=2$ (iv) $n=3, l=1$ can be placed in order of increasing energy, from the lowest to highest, as

(A) (iv) < (ii) < (iii) < (i) (B) (ii) < (iv) < (i) < (iii)

(C) (i) < (iii) < (ii) < (iv) (D) (iii) < (i) < (iv) < (ii) (I.I.T. 1999)

Q22. Which electron level would allow the hydrogen atom to absorb a photon but not emit a photon

(A) 3s (B) 2p (C) 2s (D) 1s (I.I.T. 1984)

Q23. The maximum probability of finding an electron in the d_{xy} orbital is

(A) along the x-axis (B) along the y-axis

(C) at an angle of 45^0 from the x and y axes (D) at an angle of 90^0

Q24. The quantum numbers +1/2 and -1/2 for the electron spin represent

(A) rotation of the electron in clockwise and anticlockwise direction respectively

(B) rotation of the electron in anticlockwise and clockwise direction respectively

(C) magnetic moment of the electron pointing up and down respectively

(D) two quantum mechanical spin states which have no classical analogue (I.I.T. 2001)

Q25. An electron has magnetic quantum number as -3. Its principal quantum number can be

(A) 1 (B) 2 (C) 3 (D) 4

Q26. Magnetic and spin quantum number of an electron are -1 and +1/2 respectively. This electron cannot be in

(A) s orbital (B) p orbital (C) d orbital (D) f orbital

Q27. Which of the following statement is not correct for an electron that has the quantum numbers 4 = and m =2

(A) then electron may have the quantum number s = +1/2

(B) the electron may have the quantum number l = 2

(C) the electron may have the quantum number l = 3

(D) the electron may have the quantum number l = 0,1,2,or 3

Q28. Which one the following sets of quantum number is incorrect

	principal quantum number (n)	azimuthal quantum number (l)	magnetic quantum number (m)
(A)	1	0	0
(B)	2	0 and 1	0 and 0, $\pm$ 1
(C)	3	0 and 1 and 2	0 and 0, $\pm$ 1 and 0, $\pm$ 1, $\pm$ 2
(D)	none of the above		

Q29. Which of the following is not possible
(A) two electrons of an atom may have identical values of n,l and m
(B) a 4d electrons of may have n = 4 and l = 3
(C) two electrons of equal energy occupying p-orbitals of an atom may have parallel spin
(D) two electron of equals energy occupying p-orbitals of an atom may have opposite spin

Q30. The orbital angular momentum of an electron in 2s orbitals is

(A) $+\frac{1}{2}.\frac{h}{2\Pi}$ (B) 0 (C) $\frac{h}{2\Pi}$ (D) $\sqrt{2}.\frac{h}{2\Pi}$

Q31. The orbital angular momentum of an electron in an s orbital is

(A) 1 (B) zero (C) $\frac{\sqrt{2h}}{2\Pi}$ (D) all of these

Q32. For a d electron, the orbital angular momentum is

(A) $\sqrt{6\hbar}$ (B) $\sqrt{2\hbar}$ (C) $\hbar$ (D) $2\hbar$

Q33. The quantum number/s needed to describe an electron fully in an atom is/are:
(A) 1 (B) 2 (C) 3 (D) 4

Q34. The principal quantum number of an atom is related to the:
(A) size of the orbital (B) orbital angular momentum
(C) spin angular momentum (D) orientation of the orbital in space

Q35. The magnetic quantum is a number related to:
(A) size (B) shape (C) orientation (D) spin

Q36. The principal quantum number represents:
(A) shape of an orbital (B) number of electrons in an orbit
(C) distance of electron from nucleus (D) number of orbitals in an orbit

Q37. The atomic orbital is:
(A) the circular path of the electron (B) elliptical shaped orbit
(C) three-dimensional field around nucleus
(D) the region in which there is maximum probability of finding an electron

Q38. Principal, azimuthal and magnetic quantum numbers are respectively related to:
(A) size, shape and orientation (B) shape, size & orientation
(C) size, orientation and shape (D) none of the above

Q39. Any p-orbital can accommodate up to:
(A) 4 electrons (B) 2 electrons with parallel spins
(C) 6 electrons (D) 2 electrons with opposite spins

Q40. Which orbital is dumb-bell shaped?
(A) s-orbital (B) p-orbital (C) d-orbital (D) f-orbital

Q41. The maximum number of electrons that can be accommodated in f-shell is:
(A) 2 (B) 8 (C) 18 (D) 14

Q42. Which one of the following represents an impossible arrangement?

	n	l	m	s		n	l	m	s
(A)	3	2	-2	1/2	(B)	4	0	0	1/2
(C)	3	2	-3	1/2	(D)	5	3	0	1/2

Q43. Which of the following is correct for 2p-orbitals?
(A) $n = 1, l = 2$ (B) $n = 1, l = 0$ (C) $n = 2, l = 0$ (D) $n = 2, l = 1$

Q44. Which of the following represents the correct set of four quantum numbers of a 4d electron?
(A) 4, 3, 2, +1/2 (B) 4, 2, 1, 0 (C) 4, 3, -2, +1/2 (D) 4, 2, 1, -1/2

Q45. A subshell with $l = 2$ is called?
(A) s (B) p (C) d (D) f

Q46. The angular momentum of an electron depends on:
(A) principal quantum number (B) azimuthal quantum number
(C) magnetic quantum number (D) all of these

Q47. The energy of an electron of $2p_y$ orbital is:
(A) greater than $2p_x$ orbital (B) less than $2p_z$ orbital
(C) equal to 2s orbital (D) same as that of $2p_x$ and $2p_z$ orbitals

Q48. The two electrons occupying the same orbital are distinguished by:
(A) principal quantum number (B) azimuthal quantum number
(C) magnetic quantum number (D) spin quantum numbers

Q49. The maximum number of electrons in subshell is given by the expression:
(A) $4l + 2$ (B) $4l - 2$ (C) $2l + 1$ (D) $2n^2$

Q50. An electron has a spin quantum number +1/2 and magnetic quantum number -1. It cannot be present in:
(A) d-orbital (B) f-orbital (C) s-orbital (D) p-orbital

Q51. The value of azimuthal quantum number of electrons present in 4p-orbital is:
(A) 1 (B) 2
(C) any value between 0 and 3 except 1 (D) zero

Q52. For the energy levels in an atom which one of the following statements is correct?
(A) the 4s sub-energy level is at a higher energy that the 3d sub-energy level
(B) The M-energy level can have maximum of 32 electrons
(C) The second principal energy level can have four orbitals and contain a maximum of 8 electrons
(D) The 5th main energy level can have maximum of 50 electrons

Q53. The set of quantum numbers not applicable for an electron in an atom is

	n	l	m	s		n	l	m	s
(A)	1	1	1	1/2	(B)	1	0	0	+1/2
(C)	1	0	0	+1/2	(D)	2	0	0	+1/2

Q54. Quantum No. $l = 2$ and m = 0 represent which orbital:
(A) d_{xy} (B) $d_{x^2 - y^2}$ (C) d_{z^2} (D) d_{zx}

Q55. d_{z^2} orbital has:
(A) A lobe along Z-axis and a ring along X-Y plane
(B) A lobe along Z-axis and a lobe along X-Y plane
(C) A lobe along Z-axis and a ring along Y-Z plane
(D) A lobe and ring along Z-axis

Q56. For the energy levels in an atom which one of the following statements is(are) correct?
(A) There are seven principal electron energy levels
(B) The second principal energy level can have 4 subenergy levels and contain a max. of 8 electrons
(C) The M energy level can have a maximum of 32 electrons
(D) The 4s sub-energy level is at a lower energy that the 3d sub-energy level

Q57. Which of the following statements are correct for an electron that has n = 4 and m = -2?
(A) The electron may be in a d-orbital
(B) The electron is in the fourth principal electronic shell
(C) The electron may be in a p-orbital
(D) The electron must have the spin quantum number = +1/2.

Q58. Which of the following statement is/are wrong?
(A) If the value of $l = 0$, the electron distribution is spherical
(B) The shape of the orbital is given by magnetic quantum no.
(C) Angular moment of 1s, 2s, 3s electrons are equal
(D) In an atom, all electrons travel with the same velocity

Q59. The wave mechanical model of atom is based upon
(A) de Broglie concept of dual character of matter (B) Heisenberg's uncertainty principle
(C) Schrodinger wave equation (D) all the above three

Q60. Which of the following statements is incorrect?
(A) Probabilities are found by solving Schrodinger wave equation
(B) Energy of the electron at infinite distance is zero and yet it is maximum
(C) Some spectral lines of an element may have the same wave number
(D) The position and momentum of a rolling ball can be measured accurately

Q61. Choose the correct statement
(A) Electronic energy is positive
(B) ψ^2 represents the probability of finding an electron per unit volume
(C) ψ represents the probability of finding an electron
(D) none of the above is correct

Q62. For s-orbitals, since ψ (orbital) is independent of angles, the probability (ψ^2) is
(A) also independent of angles (B) spherically symmetric
(C) both (A) and (B) are correct (D) both (A) and (B) are incorrect

Q63. Splitting of spectral lines when atoms are subjected to strong electric field is called:
(A) zeeman effect (B) stark effect (C) decay (D) disintegration

Q64. Which of the following statements is not correct?
(A) The shape of an atomic orbital depends on the azimuthal quantum number
(B) The orientation of an atomic orbital depends on the magnetic quantum number
(C) The energy of an electron in an atomic orbital of multi election atom depends on the principal quantum number
(D) The number of degenerate atomic orbitals of one type depends on the values of azimuthal and magnetic quantum numbers.

Q65. Which of the following statement concerning the four quantum numbers is false
(A) n gives idea of the size of an orbital
(B) *l* gives the shape of an orbital
(C) m gives the energy of the electron in the orbital
(D) s gives the direction of spin of the electron in an orbital.

Q66. Which one of the statement of quantum numbers is false?
(A) Quantum number were proposed out of necessity in Bohr model of the atom.
(B) Knowing n and *l* it is possible to designate a subshell.
(C) The principal quantum number alone can give the complete energy of an electron in any atom.
(D) Azimutal quantum number refers to the subshell to which an electron belongs and describes the motion of the electron.

Q67. Which of the following transitions are allowed in the normal electronic emission spectrum of an atom?
(A) $2s \rightarrow 1s$ (B) $2p \rightarrow 1s$ (C) $3d \rightarrow 2p$ (D) $5d \rightarrow 2s$

Q68. The probability of finding an electron in the p_x orbital is
(A) zero at nucleus (B) the same on all the sides around nucleus
(C) zero on the z-axis (D) maximum on the two opposite sides of the nucleus along the x-axis

Q69. The spin of the electron
(A) increases the angular momentum
(B) decreases the angular momentum
(C) can be forward (clockwise) relative to the direction of the path of the electron.
(D) can be backward (anti-clockwise) relative to the direction of the path of the electron

Q70. When an atom is placed in the magnetic field, then due to the presence of electrons in it
(A) the orbitals do not orient themselves relative to the magnetic field.
(B) the orbitals orient themselves relative to the magnetic field.
(C) there are (2l + 1) different values of m for each value of l
(D) there are (2) different values of m for each value of 1.

Q71. The quantum numbers +1/2 and -1/2 for the electron spin represent
(A) rotation of the electron in clockwise and anticlockwise derection respectively
(B) rotation of the electron in anticlockwise and clockwise direction respectively
(C) magnetic moment of the electron pointing up and down respectively
(D) two quantum mechanical spin states which have no classical analogue

Q72. The set of quantum number for the 19^{th} electrons in chromium is
(A) n = 4, l = 0, s = +1/2 or -1/2 (B) n = 3, l = 2, m = 1, s = +1/2 or -1/2
(C) n = 3, l = 2, m = -1, s = +1/2 or -1/2 (D) n = 4, l = 1, m = 0, s = +1/2 or -1/2

Q73. Which of the following subshell can accommodate as many as 10 electrons?
(A) 2d (B) 3d (C) 3dxy (D) $3dz^2$

The questions given below consist of an 'Assertion' (A) and the 'Reason' (R). Use the following key for the appropriate answer.

(A) If both (A) and (R) are correct and (R) is the correct reason for (A).
(B) If both (A) and (R) are correct but (R) is not the correct explanation for (A)
(C) If (A) is correct but (R) is not.
(D) If (A) is incorrect but (R) is correct
(E) If assertion (A) & reason (R) both are incorrect.

Q74. *Assertion :* For n = 3, l = 0, 1 & 2, and m = 0, 0, $\pm$ 1, & 0, $\pm$1, $\pm$2
Reason : For a given value of n, the values of l are all integers from 0 to n-1 and for a given value of l, the values of m are all integers from $-l$ to $+l$ including 0.

Q75. *Assertion :* The energy of an electron is largely determined by its principal quantum number.
Reason : The principal quantum number (n) is a measure of the most probable distance of finding the electrons around the nucleus.

Q76. *Assertion :* The p-orbital is dumb bell shaped.
Reason : The magnetic quantum number (m) can have three values in the case of a p-orbitals.

Q77. *Assertion :* For n =3, *l* may be 0, 1, and 2 and m may be 0, ± 1 and 0, ± 1 and ± 2.
Reason : For each value of n, there are 0 to (n -1) possible values of *l*: for each value of *l*, there are 0 to $\pm$ *l* values of m.

Q78. *Assertion :* p-orbital is dumb-bell shaped.
Reason : Electron present in p-orbital can have any one of the three values of magnetic quantum number, i.e. 0, +1 or -1.

Q79. *Assertion :* A special line will be seen for $2p_x$ - $2p_y$ transition.
Reason : Energy is released in the form of wave of light when the electron drops from $2p_x$ to $2p_y$ orbital.

Q80. *Assertion :* Limiting line in the Balmer series has a wavelength of 364.4 mm.
Reason : Limiting line is obtained for a jump of electron from n = ∞.

Q81. *Assertion :* Each electron in an atom has two spin quantum number.
Reason : Spin quantum numbers are obtained by solving schrodinger wave equation.

Q82. *Assertion :* The main shell with principal quantum number n = 2 has four orbitals present in it.
Reason : Number of orbitals present in a shell is given by n^2.

Q83. *Assertion :* Ten distinct set of four quantum numbers are possible for d-subshell.
Reason : d-subshell splits into five orbitals.

Q84. *Assertion :* $3d_{z^2}$ orbital is spherically symmetrical
Reason : $3d_{z^2}$ orbital is the only d-orbital which is spherical in shape.

Q85. *Assertion :* Orbitals form the basis of the electronic structure of atoms.
Reason : An atomic orbital is the wave function ψ for an electron in an atom.

Q86. *Assertion :* Fine lines are observed in spectra if an atom is placed in a magnetic field.
Reason : Degenerate orbitals split in the presence of magnetic field

Q87. *Assertion :* Spin quantum number can have the value +½ or –½.
Reason : (+) sign here signifies the wave function.

Q88. *Assertion :* Magnetic quantum number can have the value $l = 0, ..., (n–1)$
Reason : Magnetic quantum number specifies the number of orbitals.

Q89. *Assertion :* 5s orbital has greater energy than 4s.
Reason : Energy of the orbital depends on the azimuthal quantum number.

Q90. *Assertion :* Total number of orbitals associated with principal quantum number n = 3 is 6
Reason : Number of orbitals in a shell equals to 2n.

Q91. *Assertion :* Energy of the orbitals increases as $1s < 2s = 2p < 3s = 3p < 3d < 4s = 4p + 4d = 4f < .....$
Reason : Energy of the electron depends completely on principal quantum number.

Q92. *Assertion :* Splitting of the spectral lines in the presence of magnetic field is known as stark effect.
Reason : Line spectrum is simplest for hydrogen atom.

Q93. *Assertion :* Orbit and orbital are synonymous.
Reason : Both represent a circular path around which electron moves.

Q94. *Assertion :* Atomic orbital in an atom is designated by n, l, m_l and m_s.
Reason : These are helpful in designated electron present in an orbital.

Q95. *Assertion :* Total numberof electrons in a subshell designated by azimuthal quantum number l is $2l + 1$.
Reason : l can have value 1, 2, 3.....n–1, where n is principal quantum number.

Q96. *Assertion :* Shape associated with the orbital designated by n=2, l=1 is double dumb-cell.
Reason : It belongs to d-orbital.

Q97. *Assertion :* A spectral line will be observed for a $2p_x - 2p_y$ transition..
Reason : The energy is released in the form of wavelight when electron drops from $2p_x$ to $2p_y$ orbital.

Q98. *Assertion :* An orbital cannot have more than two electrons, moreover, if an orbital has two electrons they must have opposite spins.
Reason : No two electrons in an atom can have same set of all the four quantum numbers.

ANSWERS

Q1. n = 2, l = 0, m = –1, 0, +1, s = $\pm$½ Q2. 10es$^-$ {3d^{10}} Q3. (i) - (18), (ii)-(2), (iii)-(10), (iv)-(1)

Q4. n = 5, m = –4 to +4, no. of electrons = 18 Q5. (iii) > (i) > (ii) > (iv) Q6. g subshell

Q7. B	Q8. A	Q9. C	Q10. A	Q11. A	Q12. C	Q13. B
Q14. C	Q15. A	Q16. A	Q17. A	Q18. D	Q19. C	Q20. B
Q21. A	Q22. D	Q23. C	Q24. D	Q25. D	Q26. A	Q27. D
Q28. D	Q29. B	Q30. B	Q31. B	Q32. A	Q33. D	Q34. A
Q35. C	Q36. C	Q37. D	Q38. A	Q39. D	Q40. B	Q41. D
Q42. C	Q43. D	Q44. D	Q45. C	Q46. B	Q47. D	Q48. D
Q49. A	Q50. C	Q51. A	Q52. CD	Q53. A	Q54. C	Q55. A
Q56. A	Q57. AB	Q58. BD	Q59. D	Q60. C	Q61. B	Q62. C
Q63. B	Q64. D	Q65. C	Q66. ACD	Q67. ABCD	Q68. ACD	Q69. CD
Q70. BC	Q71. D	Q72. A	Q73. B	Q74. A	Q75. A	Q76. B
Q77. A	Q78. B	Q79. D	Q80. A	Q81. D	Q82. A	Q83. A
Q84. E	Q85. A	Q86. A	Q87. C	Q88. D	Q89. C	Q90. E
Q91. C	Q92. D	Q93. E	Q94. D	Q95. C	Q96. E	Q97. E
Q98. A						

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QUEST TUTORIALS

TARGET IIT JEE

PHYSICAL CHEMISTRY

ELECTRONIC CONFIGURATION

Q1. Write down the electronic configurations of the elements having the following atomic numbers in s, p, d and f notation :
(i) 17 (ii) 18 (iii) 19 (iv) 24 (v) 25 (vi) 29 (vii) 30 (viii) 31 (ix) 39
(x) 47 (xi) 56

Q2. Write down the electronic configurations of the following ions :
(i) Cr^{3+} (ii) Mn^{4+} (iii) Ti^{2+} (iv) Cu^{2+}
Atomic number: Cr=24, Mn=25, Ti= 22, Cu= 29.

Q3. Arrange the electrons represented by the following sets of quantum numbers in the decreasing order of energy.

(i) $n = 4, l = 0, m_l = 0, m_s = +\frac{1}{2}$ (ii) $n = 3, l = 1, m_l = 1, m_s = -\frac{1}{2}$

(iii) $n = 3, l = 2, m_l = 0, m_s = +\frac{1}{2}$ (iv) $n = 3, l = 0, m_l = 0, m_s = -\frac{1}{2}$

Note : Magnetic and spin quantum numbers are denoted by m_l and m_s respectively in this question

Q4. How many unpaired electrons are there in each of the following in the ground state ?
(i) O, (ii) O^+, (iii) O^-, (iv) Fe, (v) Mn, (vi) S (vii) F, (viii) Ar.

Q5. State whether the following statements are true or false :
(i) The outer electronic configuration of the ground state chromium atom is $3d^4, 4s^2$. (If false, give the correct statement)

(ii) The electron density in the xy plane in $3d_{x^2-y^2}$ orbital is zero.

Q6. Explain the following with proper reasoning : Fe^{3+} is more stable than Fe^{2+}

Q7. The number of nodal planes in a P_x orbitals is
(A) one (B) one (C) three (D) zero

Q8. The electrons, identified by quantum by numbers n and l, (i) $n = 4, l = 1$ (ii) $n = 4, l = 0$ (iii) $n = 3, l = 2$ (iv) $n = 3, l = 1$ can be placed in order of increasing energy, from the lowest to highest, as
(A) (iv) < (ii) < (iii) < (i) (B) (ii) < (iv) < (i) < (iii)
(C) (i) < (iii) < (ii) < (iv) (D) (iii) < (i) < (iv) < (ii)

Q9. Krypton $(_{36}Kr)$ has the electronic configuration $[Ar]4s^2, 3d^{10}, 4p^6$. The 37th electron will go into which of following subshells
(A) 4f (B) 4d (C) 3p (D) 5s

Q10. The electronic configuration of fluorine is
(A) $1s^2, 2s^2, 2p_x^1, 2p_y^1, 2p_z^1$ (B) $1s^2, 2s^2, 2p_x^2, 2p_y^1, 2p_z^1$
(C) $1s^2, 2s^2, 2p_x^2, 2p_y^2, 2p_z^1$ (D) $1s^2, 2s^2, 2p_x^2, 2p_y^2, 2p_z^2$

Q11. The number of unpaired electrons in chromic ion (Cr^{3+}) is (atomic number of Cr = 24)
(A) 6 (B) 4 (C) 3 (D) 1

Q12. The number of unpaired electrons in ground state of nickel atom is (Atomic number of Ni = 28)
(A) 2 (B) 3 (C) 4 (D) 5

Q13. Which of the following has maximum number of unpaired electrons

(A) Fe^{++} (B) Co^{++} (C) Mn^{++} (D) Cr^{++}

(Atomic numbers : Fe = 26, Co = 27, Mn = 25, Cr = 24,)

Q14. If the nitrogen atom had electronic configuration $1s^7$, it would have energy lower than of the normal ground state configuration $1s^2, 2s^2, 2p^3$, because the electron would be closer to the nucleus. Yet $1s^7$, is not observed because it violates

(A) Heisenberg's uncertainty principle (B) Hund's rule

(C) Pauli's exclusion principle (D) Bohr postulate of stationary orbit

Q15. Which one of the following is paramagnetic

(A) Zn^{2+} (B) Ni^{2+} (C) Cu^{+} (D) none of the above

Q16. Which of the following ions has the maximum magnetic moment

(A) V^{3+} (B) Mn^{3+} (C) Fe^{3+} (D) Cu^{2+}

Q17. The maximum number of permissible rotational orientations of the 2s electron of lithium atom in ground state is

(A) 1 (B) 2 (C) 3 (D) 4

Q18. Beryllium's fourth electron will have the four quantum numbers:

	n	l	m	s		n	l	m	s
(A)	1	0	0	1/2	(B)	1	1	1	1/2
(C)	2	0	0	-1/2	(D)	2	1	0	+1/2

Q19. For the energy levels in an atom which one of the following statements is correct?

(A) the 4s sub-energy level is at a higher energy that the 3d sub-energy level

(B) The M-energy level can have maximum of 32 electrons

(C) The second principal energy level can have four orbitals and contain a maximum of 8 electrons

(D) The 5th main energy level can have maximum of 50 electrons

Q20. For the energy levels in an atom which one of the following statements is(are) correct?

(A) There are seven principal electron energy levels

(B) The second principal energy level can have 4 subenergy levels and contain a max. of 8 electrons

(C) The M energy level can have a maximum of 32 electrons

(D) The 4s sub-energy level is at a lower energy that the 3d sub-energy level

Q21. The electronic configuration of a dipositive ion M^{2+} is 2,8, 14 and its atomic mass is 56. The number of neutrons in the nucleus would be:

(A) 30 (B) 32 (C) 34 (D) 42

Q22. Correct set of four quantum numbers for the outermost electron of rubidium (Z=37) is:

(A) 5, 0, 0, 1/2 (B) 5, 1, 0, 1/2 (C) 5, 1, 1, 1/2 (D) 6, 0, 0 1/2

Q23. The magnetic quantum number for valency electron of sodium atom is:

(A) 3 (B) 2 (C) 1 (D) zero

Q24. After filling the 4d-orbitals, an electron will enter in:

(A) 4p (B) 4s (C) 5p (D) 4f

Q25. The order of increasing energies of the orbitals follows:

(A) 3s, 3p, 4s, 3d, 4p (B) 3s, 3p, 3d, 4s, 4p

(C) 3s, 3p, 4s, 4p, 3d (D) 3s, 3p, 3d, 4p, 4s

Q26. How many of unpaired electron in carbon atom is:
(A) 2 (B) 4 (C) 1 (D) 4

Q27. The energy is lowest for the orbital:
(A) 3d (B) 4p (C) 4s (D) 4f

Q28. Consider the following statements:
(a) Electron density in the XY plane in $3d_{x^2-y^2}$ orbital is zero
(b) Electron density in the XY plane in $3d_{z^2}$ orbital is zero
(c) 2s orbital has one nodal surface
(d) For $2p_z$ orbital YZ is the nodal plane.
Specify True or False.

Q29. Consider the electronic configuration for neutral atoms:
(i) $1s^2 2s^2 p^6 3s^1$ (ii) $1s^2 2s^2 2p^6 4s^1$
Which of the following statements is/are false?
(a) Energy is required to change (i) to (ii)
(b) (i) represents 'Na' atom
(c) (i) and (ii) represent different elements
(d) More energy is required to remove one electron from (i) than (ii)

Q30. The set of quantum number for the 19th electrons in chromium is
(A) n = 4, l = 0, s = +1/2 or -1/2 (B) n = 3, l = 2, m = 1, s = +1/2 or -1/2
(C) n = 3, l = 2, m = -1, s = +1/2 or -1/2 (D) n = 4, l = 1, m = 0, s = +1/2 or -1/2

Q31. When 4 d orbital is complete, the newly entering electrons goes in to
(A) 5f (B) 5d (C) 5p (D) 6d orbital

Q32. Phosphorous is having three unpaired electrons according to
(A) Hund's rule (B) Aufbau principle
(C) Pauli's exclusion principle (D) Heisenberg's principle

Q33. The electronic configuration together with the quantum number of last electron for lithium is
(A) $1s^2 2s^1$ 2, 0, 0 + 1/2 (B) $1s^2 2s^1$ 2, 0, 0 + 1/2 or - 1/2
(C) $1s^2 2s^0 2p^1$ 2, 1, 0 $\pm$ 1/2 (D) $1s^2 2s^1$ 2, 1, 0 $\pm$ 1/2

Q34. The electronic configurations of Cr^{24} and Cu^{29} are abnormal
(A) Due to extra stability of exactly half filled and exactly fully filled sub shells
(B) Because they belong to d-block
(C) Both the above
(D) None of the above

Q35. Choose the correct altenatives. The number of unpaired electrons in an atom of
(A) $_{14}Si$ is 2. (B) $_{14}Si$ is 0 (C) $_{15}P$ is 3 (D) $_{15}P$ is 1

Q36. Which of the following ions are diamagnetic?
(A) He_2^+ (B) Sc^{3+} (C) Mg^{2+} (D) O_2^{2-}

Q37. Choose the pair whose ions have the similar electronic configuration
(A) Lithium and sodium (B) Potassium and calcium
(C) Sodium and potassium (D) Oxygen and chlorine

Q38. The electronic configuration of an element is $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$. This represents its
(A) excited state (B) ground state (C) cationic form (D) anionic form

Q39. In potassium atom, electronic energy level is in the following order
(A) 4s > 3d (B) 4s < 2p (C) 4s < 3d (D) 4s > 4p

Q40. The subshell that arises after f is called g subshell.
(a) How many g orbital are present in the g subshell?
(b) In what principal electronic shell whould the g subshell first occur and what is the total number of orbitals in this principal shell?

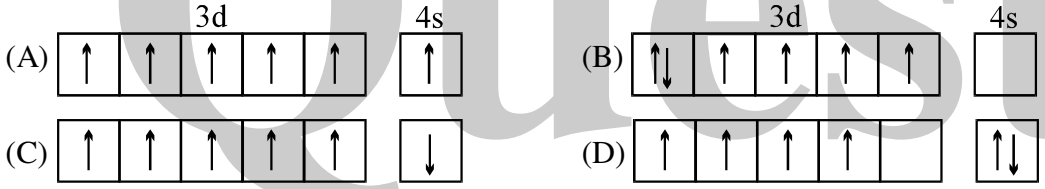
Q41. Write appropriate values of n & *l* quantum numbers for each of the following orbital designations. Also arrange in the increasing order of energy
(a) 4s (b) 3p (c) 5f (d) 6g (e) 3d (f) 7s

Q42. State the basic ideas that are violated by each of the following electron configuration and replace each by the correct configuration:
(a) B_5 - $1s^2 2s^3$ (b) Na_{11} - $1s^2 2s^2 2p^6 2d^1$
(c) K_{19} - $(Ar)3d^1$ (d) Ti_{22} - $(Ar)4s^2 4p^2$
(e) Hg_{80} - $(Xe)\ 4f^{10}5d^{10}6s^2 6p^4$

Q43. Which of the following will be coloured ion:
(A) Fe^{2+} (B) Cu^{+} (C) Sc^{3+} (D) Mn^{2+}

Q44. What would be the electronic configuration of Cs(Z=55) in each case.
(a) If there were three possibilities of the electron spin.
(b) If the quantum number, *l*, could have the value, n, and if all the rules governing electron configuration were otherwise valid.

Q45. Which of the following arrangements of electrons in mostly likely to be stable:



Q46. Which of the following orbitals has/have zero probability of finding the electron in xy plane:
(A) p_z (B) d_{yz} (C) d_{zx} (D) p_x

Q47. Each orbital has a nodal plane. Which of the following statements about nodal planes are not true:
(A) A plane on which there is zero probability that the electron will be found
(B) A plane on which there is maximum probability that the electron will be found
(C) both (D) none

Q48. Write the electronic configuration of S^{2-} and Ni^{2+}.

Q49. Write detailed electronic cofigurations for the following atoms and ions: Br^-, Ca, Fe^{2+}, P.

Q50. How many unpaired electrons are there in the Ni^{2+} ion?

Q51. Write the electronic configuration for each of the following ions: (a) Co^{3+}, (b) Ni^{4+}, (c) Zn^{2+}.

Q52. Write the electronic configurations of (a) Ti^{4+}, (b) V^{3+}.

Q53. Nickel has the electron configuration $[Ar]3d^8 4s^2$. How do you account for the fact that the configuration of the next element, Cu is $[Ar]3d^{10}4s$?

Q54. What would you predict for the atomic number of the noble gas beyond Rn, if such an element had sufficient stability to be prepared or observed? Assume that g orbitals are still not occupied in the ground states of the preceding elements?

Q55. (a) Write the electron configuration for the ground state of Pr^{3+}.
(b) How many unpaired electrons would there be?

Q56. What are the electron configurations of Re^{3+} and Ho^{3+}? How many unpaired electron spins are in each of these ions?

Q57. Which properties of the elements depend on the electronic configuration of the atoms and which do not?

The questions given below consist of an 'Assertion' (A) and the 'Reson' (R). Use the following key for the appropriate answer.
(A) If both (A) and (R) are correct and (R) is the correct reason for (A).
(B) If both (A) and (R) are correct but (R) is not the correct explanation for (A)
(C) If (A) is correct but (R) is not.
(D) If (A) is incorrect but (R) is correct
(E) If (A) & (R) both are incorrect

Q58. *Assertion :* Zn^{2+} is diamagnetic.
Reason : The electrons are lost from 4s orbital to from Zn^{2+}.

Q59. *Assertion :* The configuration of boron atom can not be $1s^{2,}2s^3$.
Reason : Hund's rule demands that the configuration should display maximum multiplicity.

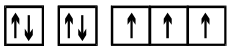
Q60. *Assertion :* The free gaseous Cr atom has six unpaired electrons.
Reason : Half filled s orbital has greater stability.

Q61. *Assertion :* An orbital cannot have more than two electrons
Reason : The two electrons in an orbital create opposite magnetic field.

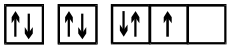
Q62. *Assertion :* Electronic configuraton of an element is $1s^2 2s^1$.
Reason : In 2s, 2 signifies the maximum capacity of s-subshell.

Q63. *Assertion :* Energy of the orbitals increases as
$1s < 2s = 2p < 3s = 3p < 3d < 4s = 4p + 4d = 4f < .....$
Reason : Energy of the electron depends completely on principal quantum number.

Q64. *Assertion :* The electronic configuration of nitrogen atom is represented as



and not as



Reason : The electronic configuration of the ground state of an atom is the one which has the greatest nultiplicity.

Q65. *Assertion :* There are two spherical nodes in 3s orbital.
Reason : There is no planar node is 3s orbital.

ANSWERS:

Q1. (i) Cl; (ii) Ar; (iii) K; (iv) Cr; (v) Mn; (vi) Cu; (vii) Zn; (viii) Ga; (ix) ; (x) Ag; (xi) Ba

Q3. (iii) > (i) > (ii) > (iv) Q4. (i) 2; (ii) 3; (iii) 1; (iv) 4; (v) 5; (vi) 2; (vii) 1; (viii) 0

Q5. (i) False (ii) False Q6. Half-filled

Q7. A	Q8. A	Q9. D	Q10. C	Q11. C	Q12. A
Q13. C	Q14. C	Q15. B	Q16. C	Q17. B	Q18. C
Q19. CD	Q20. AD	Q21. A	Q22. A	Q23. D	Q24. C
Q25. A	Q26. A	Q27. A	Q28. (a) F (b) T (c) T (d) F		Q29. (a) T (b) T (c) F (d) T
Q30. A	Q31. C	Q32. A	Q33. B	Q34. A	Q35. A
Q36. C	Q37. AC	Q38. B	Q39. C	Q40. (a) 9; (b) 2s	

Q41. (a) 4, 0 (b) 3, 1 (c) 5, 3 (d) 6, 4 (e) 3, 2 (f) 7, 0; $3p < 4s\ 3d < 7s < 5f < 6g$

Q42. (a) $2s^2 2p^1$; (b) $3s^1$; (c) $4s^1$; (d) $3d^2$; (e) $4f^{14} 5d^{10} 6s^2$ Q43. A

Q44. (a) $1s^3 2s^3 2p^9 3s^3 3p^9 3d^{15} 4s^3 4p^9 5s^1$; (b) $1s^2 1p^6 2s^2 2p^6 2d^{10}$, $3s^2 3p^6 3d^{10} 3f^1 4s^2 4p^6 5s^2$

Q45. A	Q46. A	Q47. A	Q50. 2	Q58. B	Q59. B
Q60. C	Q61. B	Q62. C	Q63. E	Q64. A	Q65. A

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PHYSICAL CHEMISTRY

STOICHIOMETRY - I

Q1. Mole fraction of solvent in 0.2 m binary aqueous solution of camphor (m = molality)
(A) 0.996 (B) 0.004 (C) 0.96 (D) 0.976

Q2. Volume V_1 ml of 0.1 M $K_2Cr_2O_7$ is needed for complete oxidation of 0.678g N_2H_4 in acidic medium. The volume of 0.3 M $KMnO_4$ needed for same oxidation in acidic medium will be
(A) $\frac{2}{5}V_1$ (B) $\frac{5}{2}V_1$ (C) 113 V_1 (D) can't say

Q3. Ocidation state of sulphur in Caro's acid, H_2SO_5 is
(A) +8 (B) +6 (C) +3 (D) - 2

Q4. The molarity of Cl^- in an aqueous solution which was (w/V) 2% NaCl, 4% $CaCl_2$ and 6% NH_4Cl will be
(A) 0.342 (B) 0.721 (C) 1.12 (D) 2.18

Q5. The molar ratio of Fe^{++} to Fe^{+++} in a mixture of $FeSO_4$ and $Fe_2(SO_4)_3$ having equal number of sulphate ion in both ferrous and ferric sulphate is
(A) 1 : 2 (B) 3 : 2 (C) 2 : 3 (D) can't be determined

Q6. How many mg of quick lime is required to remove hardness of 1 Kg of hard water having 366 ppm of HCO_3 and Ca^{++} as the only cation
(A) 72 mg (B) 84 mg (C) 168 mg (D) 170 mg

Q7. DNA has density 1.1 gm/ml and its molecular weight is 6×10^3 g/mol. Average volume occupied by its single molecule will be
(A) 9.1×10^{-20}cc (B) 9.1×10^{-21}cc (C) 9.8×10^{-21}cc (D) 9.6×10^{-20}cc

Q8. How many ml of 0.3M $K_2Cr_2O_7$ (acidic) is required for complete oxidation of 5 ml of 0.2 M SnC_2O_4 solution
(A) 3.33 ml (B) 2.22 ml (C) 11 ml (D) 4.44 ml

Q9. In the balanced chemical reaction:
$$aCrO_4^{2-} + bFe(OH)_2 + 4H_2O \rightarrow cCr(OH)_3 + dFe(OH)_3 + OH^-$$
the value of a, b, c and d are respectively
(A) 1, 4, 3, 1 (B) 1, 3, 1, 3 (C) 1, 3, 4, 1 (D) 3, 4, 3, 1

Q10. In which of the compound(s) Iodine has positive oxidation state
(A) Iodoform (B) I_2O_5 (C) ICl (D) HIO_3

Q11. For the conversion of 0.240 g NaH_2PO_4 in a solution to monohydrogen phosphate, 21.4 ml NaOH solution is needed. The molarity of NaOH solution will be
(A) 0.093 (B) 0.93 (C) 0.087 (D) 0.083

Q12. 22.7 ml of N/10 Na_2CO_3 solution neutralises 10.2 ml of dilute H_2SO_4. Then the volume of water that must be added to 400 ml of same H_2SO_4 to make it exactly N/10 is
(A) 245 ml (B) 484.6 ml (C) 480 ml (D) 490.2 ml

Q13. The volume of NH_3(at STP) needed to pass into 30 ml of 1N H_2SO_4 solution to bring down its strength to M/10 is
(A) 0.5 litre (B) 636 ml (C) 537.6 ml (D) 540.3 ml

Q14. 1.0 gm of a mixture of $CaCO_3$ and NaCl reacts completely with 120 ml of N/10 HCl. The percentage of NaCl in the mixture is
(A) 40% (B) 50% (C) 60% (D) 66%

Q15. 50 g of 8% by mass NaOH is mixed with 100 g of 8% by mass of HCl, the resulting solution is
(A) acidic (B) basic (C) neutral (D) strongly basis

Q16. 0.62g $Na_2CO_3 . xH_2O$ completely neutralises 100 ml of N/10 H_2SO_4. The value of x muxt be
(A) 1 (B) 6 (C) 8 (D) 10

Q17. How many litre of O_3 at STP will be needed to completely oxidise 10 ml of 0.4M KI into I_2
(A) 0.448 (B) 0.0448 (C) 4.48 (D) 2.24

Q18. How many moles of $FeCr_2O_4$ can be oxidised completely by 1 mole of $KMnO_4$ in acidic medium.
(A) 7 (B) 5 (C) 7/5 (D) 5/7

Q19. A sample of $Ca_3(PO_4)_2$ contains 3.1 g phosphorous, the weight of Ca in the sample is
(A) 6 gm (B) 4 gm (C) 2 gm (D) 5.56 gm

Q20. For an infinitely dilute aqueous solution molality will be equal to
(A) formality (B) molarity (C) mole fraction (D) ppm

Q21. $KI + I_2 + HNO_3 \rightarrow HIO_3 + KIO_3 + NO_2$
If 3 mole of KI & 2 moles I_2 are reacted with excess of HNO_3, volume of NO_2 gas evolved at NTP is
(A) 716.8Lt (B) 1075.2Lt (C) 44.8Lt (D) 67.2Lt

Q22. If a piece of iron gains 10% of its weight due to partial rusting into Fe_2O_3. the percentage of total iron that has rusted is
(A) 23 (B) 13 (C) 23.3 (D) 25.67

Q23. In which of the following reaction equivalent weight of oxidant is not difined
(A) $2BrO_3^- + 12H^+ + 10e^- \rightarrow Br_2 + 6H_2O$
(B) $BrO_3 + eH^+ + 6e^- \rightarrow Br^- + 3H_2O$
(C) $3Br_2 + 6CO_3 + 3H_2O \rightarrow 5Br^- + BrO_3 + 6HCO_3$
(D) $CaOCl_2 + H_2O \rightarrow Ca(OH)_2 + Cl_2$

Q24. In which of the following redox reaction 'n' factor of every reactant is non fractional
(A) $CsBr + Br_2 \rightarrow CsBr_3$ (B) $Mn_3O_4 \rightarrow Mn^{++}$
(C) $KI + I_2 \xrightarrow{water} KI_3$ (D) $NaNH_2 + N_2O \rightarrow NaN_3 + H_2O$

Q25. How many mole of electron is needed for reduction of each mole of Cr in the reaction
$CrO_5 + H_2SO_4 \rightarrow Cr_2(SO_4)_3 + H_2O + O_2$
(A) 4 (B) 3 (C) 6 (D) 7

Q26. To prepare 0.5M KCl solution from 100 ml of 0.40 M KCl
(A) add 0.745 g KCl (B) add 20 ml of water (C) add 0.1 mole KCl (D) evaporate 10 ml of water

Q27. The moles of Ammonium sulphate needed to react with one mole of MnO_2 in acidic medium in a reaction giving $MnSO_4$ and $(NH_4)_2S_2O_8$ is
(A) 2 (B) 1/2 (C) 1 (D) 1/3

Q28. A 20 ml (specific gravity 1.02) of chlorine water is treated with excess of KI and thr liberated iodine required 25 ml of 0.2N $Na_2S_2O_3$. The percentage of free chlorine in chlorine water is
(A) 0.87 (B) 87 (C) 0.78 (D) 0.82

Q29. An ore of iron, Wustite has the formula $Fe_{0.93}O_{1.00}$. The mole fraction of total iron present in the form of Fe(II) is
(A) 0.82 (B) 0.85 (C) 0.15 (D) 0.37

Q30. If 1 gm of HCl and 1 gm of MnO_2 heated together the maximum weight of Cl_2 gas evolved will be
(A) 2 gm (B) 0.975 gm (C) 0.486 gm (D) 0.972 gm

Q31. 35ml sample of hydrogen peroxide gives off 500 ml of O_2 at 27°C and 1 atm pressure. Volume strength of H_2O_2 sample will be
(A) 10 volume (B) 12.8 volume (C) 11 volume (D) 12 volume

Q32. When 143.6 mg $ZnSO_4 . xH_2O$ is heated strongly in the absence of air, 40.5 mg yellow residue is obtained. Value of x is
(A) 7 (B) 5 (C) 6 (D) 2

Q33. Percentage of free SO_3 in an oleum bottle labelled 113.5% H_2SO_4 is
(A) 40 (B) 60 (C) 50 (D) 45

Q34. For 1.34×10^{-3} moles of $KBrO_3$ to reduce into bromide 4.02×10^{-3} mole of X^{n+} ion is needed. New oxidation state of X is
(A) n + 2 (B) n - 2 (C) 2 (D) -2

Q35. Each molecule of tear gas, Lewisite contains 2 Hydrogen atoms, 1.78×10^{-22} gm. Chlorine, 2 carbon atoms and 1.25×10^{-22} gm of an unknown metal. Its molecular weight will be
(A) 206 (B) 207.5+1 (C) 280 (D) 280.8

Q36. We have three separate solutions of KCl, $MgCl_2$ and $AlCl_3$. The concentration of Cl^- ion is same in all three solution. Which solution will require the least volume to coagulate (precipitate) a negatively charged colloidal solution.
(A) KCl solution (B) $MgCl_2$ solution (C) $AlCl_3$ solution (D) All the same

Q37. What volume of 0.3N $Cr_2O_7^{-}/H^+$ is needed for complete oxidation of 200 ml of 0.6M FeC_2O_4 soution.
(A) 1.2 cc (B) 1.2 Litre (C) 120 cc (D) 800 cc

Q38. 25 ml of Na_2CO_3 solution requires 100 ml of 0.1N HCl to reach end point with Phenolphthalein as indicator. Molarity of resulting solution with respect to HCO_3^- ion
(A) 0.008M (B) 0.004M (C) 0.16M (D) 0.08M

Q39. Which concentration of a solution will change on heating a solution
(A) molality (B) mole fraction (C) volume strength (D) %(W/V)

Q40. 5 gm of a metal carbonate on heating strongly releases 1.51 litre CO_2 gas at STP. The equivalent weight of metal is
(A) 7 (B) 23 (C) 21 (D) 5

Q41. If equal volumes of 0.1M $KMnO_4$ and 0.1M $K_2Cr_2O_7$ solutions are allowed to oxidise. Fe^{2+} to Fe^{3+} in acidic medium, then Fe^{2+} oxidised will be
(A) more by $KMnO_4$ (B) more by $K_2Cr_2O_7$ (C) equal in both cases (D) can't be determined.

Q42. Equivalent weight of MnO_4^- in acidic, basic and nuetral medium are in the ratio of
(A) 3 : 5 : 15 (B) 5 : 3 : 1 (C) 5 : 1 : 3 (D) 3 : 15 : 5

Q43. Cl_2 reacts with hot NaOH solution, oxidation number of chlorine changes from
(A) -1 to 0 (B) 0 to -1 (C) 0 to +5 (D) b; c.

Q44. Molarity of H_2SO_4 is 18 M. Its density is 1.8 g/cm^3, hence molality is
(A) 18 (B) 100 (C) 36 (D) 500

Q45. x g of the metal gave y g of its oxide. Hence equivalent weight of the metal

(A) $\frac{y-x}{x} \times 8$ (B) $\frac{x}{(y-x)} \times 8$ (C) $\frac{x}{y} \times 8$ (D) $\frac{x+y}{x} \times 8$

Q46. Mole fraction of ethyl alcohol in aqueous ethyl alcohol solution is 0.25. Hence percentage of ethyl alcohol by weight is
(A) 54% (B) 25% (C) 75% (D) 46%

Q47. 254g of Iodine and 142 g of Chlorine are made to react completely to give a mixture of ICl and ICl_3. The moles of each one formed is
(A) 0.1M ICl and 0.1M ICl_3 (B) 1.0M ICl and 1.0M ICl_3
(C) 0.5M ICl and 0.1M ICl_3 (D) 0.5M ICl and 1.0M ICl_3

Q48. 0.1M of MnO_4^-(in acidic medium) can(Assume the volume of reducing agent will be same in the MnO_4^-)
(A) oxidise 0.25M $C_2O_4^{2-}$ (B) oxidise 0.5M Fe^{2+}
(C) oxidise 0.166M FeC_2O_4 (D) oxidise 0.6M $Cr_2O_7^{2-}$

Q49. Which of the following are redox reactions?
(A) $Zn + 2HCl \rightarrow ZnCl_2 + H_2$ (B) $Al(OH)_3 + 2HCl \rightarrow AlCl_3 + 3H_2O$
(C) Disproportionation of Cu^+ ions in a gave solution (D) $Ag^+(aq.) + I^-(aq.) \rightarrow AgI(s)$

Q50. In which of the following species, valency and oxidation numbers have different numerical values?
(A) CO_2 (B) CH_4 (C) $CHCl_3$ (D) CCl_4

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PHYSICAL CHEMISTRY

STOICHIOMETRY - II

Q1. X gm of a certain oxide of nitrogen was slowly passed over heated copper to yield CuO and N_2 gas. The increase in the weight of copper was 5.33 gm 4 litre of N_2 gas at 14^0C and 754 mm of Hg was also obtained. What is the formula of the oxide.

(A) [illegible] (B) NO_2 (C) NO (D) N_2O

Q2. CN^- is oxidised by NO_3^- in presence of acid :

$$aCN^- + bNO_3^- + cH^+ \longrightarrow (a + b)\ NO + aCO_2 + \frac{c}{2} H_2O$$

What are the values of a, b, c in that order.

(A) 3, 7, 7 (B) 3, 10, 10 (C) 3, 10, 7 (D) 3, 7, 10

Q3. One gram of Na_3AsO_4 is boiled with excess of solid KI in presence of strong HCl. The iodine evolved is absorbed in KI solution and titrated against 0.2 N hypo solution. Calculate the volume of thiosulphate hypo used. (At. wt. of As = 75)

(A) 48.1 ml (B) 24.7 ml (C) 38.4 ml (D) 30.3 ml

Q4. How many grams of Zn of 90% purity would be needed to reduce 8.5 gm of $NaNO_3$ in presence of alkali. (At. wt. of Zn = 65.4)

(A) 32.2 gm (B) 19.8 gm (C) 29.1 gm (D) 23.11 gm

Q5. 7gm of a mixture of $KClO_3$ and KCl are strongly heated, 2.50gm of O_2 is produced. The residue on analysis proves to be only KCl. Calculate the weight fraction of KCl in the original mixture.

(A) 0.0886 (B) 0.123 (C) 0.886 (D) 0.213

Q6. $S_2O_3^{2-}$ ion is oxidised by $S_2O_8^{2-}$ ion, the products are $S_4O_6^{--}$ and SO_4^{--} ions. What volume of 0.25 M thiosulphate solution would be needed to reduce 1 gm of $K_2S_2O_8$.

(A) 36.92 ml (B) 32.69 ml (C) 29.63 ml (D) 62.93 ml

Q7. An element forms two different sulphates in which its weight % is 28 and 37. What is the ratio of oxidation numbers of the element in these sulphates.

(A) 1 : 2 (B) 1 : 3 (C) 2 : 1 (D) 3 : 2

Q8. 12 gm urea (NH_2CONH_2) was treated with excess nitrous acid. The following reaction occurred.

$$NH_2CONH_2 + 2HNO_2 \longrightarrow CO_2 + 2N_2 + 3H_2O$$

The gases evolved were passed through aqueous KOH solution and the final volume of the remaining gas was measured at STP. The volume of the remaining gas will be

(A) 44.8 ml (B) 89.6 ml (C) 134.4 ml (D) 13.4 ml

Q9. The reaction between Yttrium metal and dilute HCl produces H_2(g) and Y^{3+} ions. The molar ratio of Y used to hydrogen produced is

(A) 1 : 2 (B) 2 : 1 (C) 2 : 3 (D) 3 : 2

Q10. The number of moles of $Cr_2O_7^{2-}$ needed to oxidize 0.136 equivalents of $N_2H_5^+$ by the reaction is –

$$N_2H_5^+ + Cr_2I_7^{--} \longrightarrow N_2 + Cr^{3+} + H_2O$$

(A) 0.136 (B) 0.272 (C) 0.816 (D) 0.0227

Q11. The density of liquid ethanol is 0.7893 g/ml at 20^0C. If 1.2 mol of ethanol are needed for a particular experiment, what volume of ethanol should be measured out.

(A) 55 ml (B) 58 ml (C) 70 ml (D) 79 ml

Q12. A 10gm sample of a mixture of Calcium chloride and sodium chloride is treated with Na_2CO_3 to precipitate the calcium as calcium carbonate. When $CaCO_3$ is ignited 1.62 gm CaO is obtained. The % by mass of $CaCl_2$ in the original mixture is
(A) 15.2% (B) 32.1% (C) 21.8% (D) 11.07%

Q13. The moles of Ammonium sulphate needed to react with one mole of MnO_2 in acidic medium in a reaction giving $MnSO_4$ and $(NH_4)_2S_2O_8$ is
(A) 2 (B) 1/2 (C) 1 (D) 1/3

Q14. In a reaction FeS_2 is oxidised by O_2 to Fe_2O_3 and SO_2. If the equivalent of O_2 consumed are X, then the equivalents of Fe_2O_3 and SO_2 produced are
(A) X and X (B) $\frac{X}{2}$ and X (C) $\frac{X}{11}$ and $\frac{10X}{11}$ (D) $\frac{10X}{11}$ and $\frac{X}{11}$

Q15. 100 ml of 0.6 N H_2SO_4 and 200 ml of 0.3 N HCl were mixed together. The normality of the resulting solution will be
(A) 0.1N (B) 0.2N (C) 0.3N (D) 0.4N

Q16. 1g of carbonate of a metal was dissolved in 25ml of N HCl. The resulting liquid required 5 ml of N - NaOH for neutralization. The eq. wt. of the metal carbonate is
(A) 50 (B) 30 (C) 20 (D) none

Q17. 5 ml of N – HCl, 20 ml of N/2 – H_2SO_4 and 30ml of N/3 – HNO_3 are mixed together and the volume made to 1 litre.
(i) The normality of the resulting solution is
(A) N/5 (B) N/10 (C) N/20 (D) N/40
(ii) The wt. of pure NaOH required to neutralize the above solution is
(A) 10 g (B) 2 g (C) 1 g (D) 2.5 g

Q18. If 0.5 mol of $BaCl_2$ is mixed with 0.20 mol of Na_3PO_4, the maximum amount of $Ba_3(PO_4)_2$ that can be formed is
(A) 0.70 mol (B) 0.50 mol (C) 0.20 mol (D) 0.10mol

Q19. The equivalent mass of $MnSO_4$ is half of its molar mass when it is converted to
(A) Mn_2O_3 (B) MnO_2 (C) MnO_4^- (D) MnO_4^{2-}

Q20. The anion nitrate can be converted into ammonium ion. The equivalent mass of NO_3^- ion in this reaction would be
(A) 6.20g (B) 7.75g (C) 10.5g (D) 21.0 g

Q21. The equivalent mass of $Na_2S_2O_3$ in its reaction with I_2 is equal to
(A) molar mass (B) $\frac{\text{molar mass}}{2}$ (C) $\frac{\text{molar mass}}{3}$ (D) $\frac{\text{molar mass}}{4}$

Q22. A solution of $KMnO_4$ is reduced to MnO_2. The normality of solution is 0.6. The molarity is :
(A) 1.8 M (B) 0.6 M (C) 0.1M (D) 0.2 M

Q23. When one gram of $KMnO_4$ reacts with HCl, the volume of chlorine liberated at NTP will be
(A) 11.2 litres (B) 22.4 litres (C) 44.8 litres (D) 56.0 litres

Q24. 8g of sulphur are burnt to form SO_2 which is oxidised by Cl_2 water. The solution is treated with $BaCl_2$ solution. The amount of $BaSO_4$ precipitated is

(A) 1 mol (B) 0.5 mol (C) 0.24 mol (D) 0.25 mol

Q25. In an experiment 50 ml of 0.1M solution of a salt reacted with 25 ml of 0.1M solution of sodium sulphite. The half equation for the oxidation of sulphite ion is:

$$SO_3^{2-}(aq.) + H_2O(l) \longrightarrow SO_4^{2-}(aq.) + 2H^+(aq.) + 2e^-$$

If the oxidation number of metal in the salt was 3, what would be the new oxidation number of metal?

(A) 0 (B) 1 (C) 2 (D) 4

Q26. When BrO_3^- ion reacts with Br^- ion in acid solution Br_2 is liberated. The equivalent weight of $KBrO_3$ in this reaction is

(A) M/8 (B) M/3 (C) M/5 (D) M/6

where M is its molar mass.

Q27. Hydrogen peroxide in aqueous solution decomposes on warming to give oxygen according to the equation $2H_2O_2(aq.) \longrightarrow 2H_2O(l) + O_2(g)$ under conditions where one mole of gas occupies 24 dm^3, 100cm^3 of X M solution of H_2O_2 produces 3 dm^3 of O_2 X is thus

(A) 2.5 (B) 1 (C) 0.5 (D) 0.25

Q28. One mole of a mixture of CO and CO_2 requires exactly 20 grams of NaOH in solution for complete conversion of all the CO_2 into Na_2CO_3. How many extra grams of NaOH would it require for conversion into Na_2CO_3 if the mixture (one mole) is completely oxidized to CO_2

(A) 60 grams (B) 80 grams (C) 40 grams (D) 20 grams

Q29. A solution containing both Na_2CO_3 and $NaHCO_3$ was treated with excess of $CaCl_2$ solution and filtered. The precipitate weighed m_1 grams. On adding NaOH in drops to the filtrate avoiding excess, a further m_2 grams was precipitated. If after adding excess $CaCl_2$, the solution (had not been filtered but) was simply boiled and then filtered, what would be the total weight of the precipitate?

(A) $(m_1 + m_2)$ grams (B) $\left(m_1 + \frac{m_2}{2}\right)$ grams

(C) $\left(\frac{m_1 + m_2}{2}\right)$ grams (D) $\left(m_2 + \frac{m_1}{2}\right)$ grams

Q30. One gram of a mixture of Na_2CO_3 and $NaHCO_3$ consumes y gram equivalents of HCl for complete neutralization. One gram of the mixture is strongly heated, then cooled and the residue treated with HCl. How many grams equivalents of HCl would be required for complete neutralization?

(A) 2 y gram equivalent (B) y gram equivalents
(C) 3y/4 gram equivalents (D) 3y/2 gram equivalents

Q31. The oxidation states of the most electronegative element in the products of the reaction, BaO_2 with dilute H_2SO_4 are

(A) 0 and –1 (B) –1 and –2 (C) –2 and 0 (D) –2 and +1

Q32. A solution contains Na_2CO_3 and $NaHCO_3$. 10ml of the solution required 2.5 ml of 0.1M H_2SO_4 for neutralization using phenolphthalein as indicator. Methyl orange is then added when a further 2.5 ml of 0.2 M H_2SO_4 was required. The amount of Na_2CO_3 and $NaHCO_3$ in 1 litre of the solution is

(A) 5.3 g & 4.2g (B) 3.3 g & 6.2 g (C) 4.2 g & 5.3g (D) 6.2 g & 3.3 g

Q33. 0.5g of fuming H_2SO_4 (Oleum) is diluted with water. This solution is completely neutralized by 26.7 ml of 0.4 N NaOH. The percentage of free SO_3 in the sample is
(A) 30.6% (B) 40.6% (C) 20.6% (D) 50%

Q34. 34g of hydrogen peroxide is present in 1120 ml of solution. This solution is called
(A) 10 vol solution (B) 20 vol solution (C) 30 vol solution (D) 32 vol solution

Q35. A 2g sample of xenon reacts with fluorine. The mass of the compound produced is 3.158g. The empirical formula of the compound is
(A) XeF_2 (B) XeF_4 (C) XeF_5 (D) XeF_6

Q36. In which of the following redox reaction 'n' factor of every reactant is non fractional
(A) $CsBr + Br_2 \longrightarrow CsBr_3$ (B) $Mn_3O_4 \longrightarrow Mn^{++}$
(C) $KI + I_2 \longrightarrow KI_3$ (D) $NaNH_2 + N_2O \longrightarrow NaN_3 + H_2O$

Q37. For 1.34×10^{-3} moles of $KBrO_3$ to reduce into bromide 4.02×10^{-3} mole of X^{n+} ion is needed. New oxidation state of X is
(A) n + 2 (B) n – 2 (C) 2 (D) –2

Q38. The iodide content of a solution was determined by titration with cerium (IV) sulfate in the presence of HCl, in which I^- is converted to ICI. A 250 ml sample of the solution required 20ml of 0.05 N Ce^{4+} solution. What is the iodide concentration in the original solution, in g/litre
(A) 0.254 g/lit (B) 2.54 g/lit (C) 0.508 g/lit (D) 5.08 g/lit

Q39. 0.218g of an alkaline earth metal when dissolved in dilute HCl evolved 218.2 cc of hydrogen at 17^0C and 754.4 mm collected over water. Tension of aqueous vapour at 17^0C = 14.4 mm. The equivalent weight of metal is
(A) 12.22 (B) 24.22 (C) 23.93 (D) 11.96

Q40. 1 mole of Fe_2S_3, 2 moles of H_2O and 3 moles of O_2 are allowed to react according to the equation
$$2Fe_2S_3(s) + 6H_2O(l) + 3O_2(g) \longrightarrow 4Fe(OH)_3(s) + 6S(s)$$
The number of moles of $Fe(OH)_3(s)$ that can be produced is
(A) 1.34 (B) 2 (C) 4 (D) 3

Q41. The equivalent weight of Cl_2 in the following two reactions are
$$MnO_2 + 4HCl \longrightarrow MnCl_2 + Cl_2 + 2H_2O$$
$$6NaOH + 3Cl_2 \longrightarrow 5NaCl + NaClO_3 + 3H_2O$$
(A) 35.5 & 35.5 (B) 35.5 & 71 (C) 35.5 & 14.2 (D) 35.5 & 42.6

Q42. 0.3 g of a sample of an oxalate salt is dissolved in 100cc of water. It required 90 cc of N/20 $KMnO_4$ solution for complete oxidation. The percentage of oxalate ($C_2O_4^{2-}$) in the given sample is
(A) 66 (B) 33 (C) 68 (D) 64

Q43. Two acids (A) and (B) are titrated separately each time with 25 ml of 1N Na_2CO_3 solution and required 10ml and 40 ml respectively for complete neutralization. The volumes of acid (A) and (B) require to mix to produce one litre of 1N acid solution are respectively,
(A) 200 ml of (A) and 800 ml of (B) (B) 800 ml of (A) and 200 ml of (B)
(C) 400 ml of (A) and 400 ml of (B) (D) 600 ml of (A) and 400 ml of (B)

Q44. In a reaction, Cu_2S is oxidized by reacting with oxygen to give Cu^{2+} and SO_2. If the equivalents of O_2 used were x, the equivalents of Cu^{2+} and SO_2 produced w.r.t. Cu_2S would be
(A) x and x (B) x and 0.25 x (C) 0.25x and 0.75 (D) 0.75x and 0.25x

Q45. When those compounds are used as reducing agents, the equivalent weight of KHC_2O_4, $H_2C_2O_4 \cdot 2H_2O$ each is
(A) the same as its molecular weight (B) half of its molecular weight
(C) 1/4 of its molecular weight (D) 1/8 of its molecular weight

Q46. A hydrate of iron(III) thiocynate, $Fe(SCN)_3$ was found to contain 19% H_2O. The empirical formula of the hydrate is
(A) $Fe(SCN)_3 \cdot H_2O$ (B) $Fe(SCN)_3 \cdot 2H_2O$ (C) $Fe(SCN)_3 \cdot 3H_2O$ (D) $Fe(SCN)_3 \cdot 4H_2O$

Q47. Manganese forms non-stoichiometric oxide having the general formula MnO_x. The value of x for a compound that contained 63.7% Mn, is
(A) 2.08 (B) 1.958 (C) 1.858 (D) 2.18

Q48. A sample, supposed to be pure $CaCO_3$, is used to standardize a solution of HCl. The substance was actually a mixture of $MgCO_3$ and $BaCO_3$, but the standardization was corect in spite of erroneous assumption. The percentage of $MgCO_3$ in the mixture would be
(A)30.2% (B) 72.1% (C) 27.9% (D) 69.8%

Q49. An oleum sample containing 40% SO_3 is diluted with sufficient H_2O. The % labelling of this oleum sample would be
(A) 105% (B) 107% (C) 109% (D) 111%

Q50. 6 equivalent of FeC_2O_4 on treatment with 2 mole of $K_2Cr_2O_7$ in acidic medium evolves x litre of CO_2 gas at STP. The value of x would be
(A) 22.4 *l* (B) 44.8 *l* (C) 67.2 *l* (D) 89.6 *l*

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QUEST TUTORIALS

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ORGANIC CHEMISTRY

ACIDITY, BASICITY H-BONDING & TAUTOMERISM

Students should solve this Question Bank by 17th Sept. 2006 positively

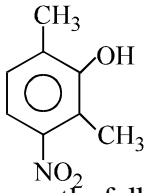
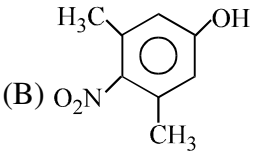
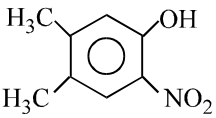
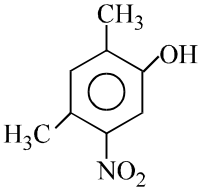
Questions No.1 to 6 (6 questions)

Acid strength is measured by the position of equilibrium of ionisation in water. In other words acid strength is the function of the stability of conjugate base of the acid. More is the stability of conjugate base of the acid, more is the acidity of acid.

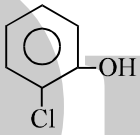
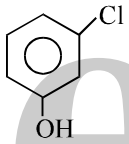
Q.1 Which one of the following is the most acidic?

(A)  (B)  (C)  (D) $CH_2=CH-CH_3$

Q.2 Which one of the following phenols will show highest acidity?

(A)  (B)  (C)  (D) 

Q.3 Arrange the following compounds in decreasing order of acidity?

(I) C_6H_5-OH (II)  (III)  (IV) 

Select the correct answer from the codes given below:

(A) III > II > IV > I (B) III > II > I > IV (C) II > III > I > IV (D) II > III > IV > I

Q.4 Which one of the following is strongest acid?

(A) $Cl-CH_2-CH_2-COOH$ (B) $Cl-CH_2-COOH$

(C) $Cl-CH_2-CH_2-CH_2-COOH$ (D) CH_3-COOH

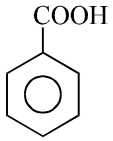
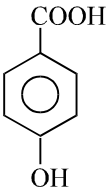
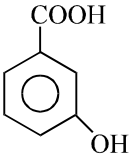
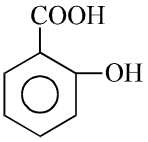
Q.5 The correct order of acidity of the given acids:

(I) CH_3COOH (II) HOOC–COOH (III) $CH_2(COOH)_2$ (IV) $HOOC-(CH_2)_4-COOH$

will be:

(A) II > IV > III > I (B) I > II > III > IV (C) II > III > IV > I (D) II > I > IV > III

Q.6 Which of the following is weakest acid?

(A)  (B)  (C)  (D) 

Question No. 7 to 9 (3 questions)

Basicity of nitrogen containing compounds are determined by the realtive availability of the non-bonding electrons on nitrogen atom to a proton donor or Lewis acid and by the stabilisation of the positive charged nitrogen atom by solvation or, in some special cases by resonance.

Q.7 Consider the following bases:

(I) o-nitroaniline (II) m-nitroaniline (III) p-nitroaniline

The decreasing order of basicity is:

(A) II > III > I (B) II > I > III (C) I > II >III (D) I > III > II

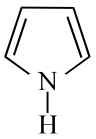
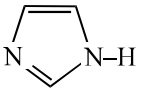
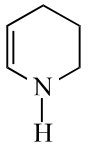
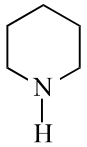
Q.8 Consider the basicity of the following aromatic amines:

(I) aniline (II) p-nitroaniline (III) p-methoxyaniline (IV) p-methylaniline

The correct order of decreasing basicity is:

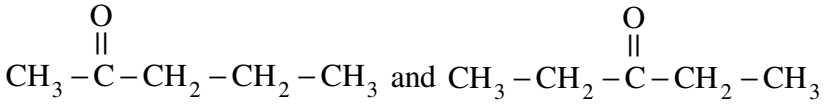
(A) III > IV > I > II (B) III > IV > II > I (C) I > II > III > IV (D) IV > III > II > I

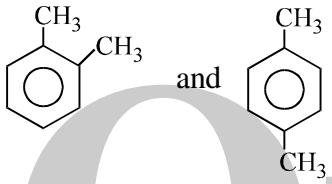
Q.9 Which one of the following is least basic in character?

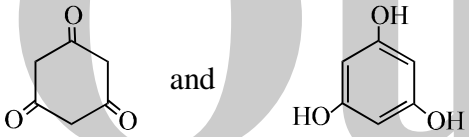
(A)  (B)  (C)  (D) 

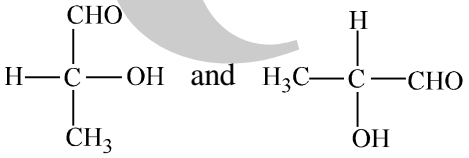
Q.10 Match List I with List II and select the correct answer from the codes given below the lists:

List I

(a) 

(b) 

(c) 

(d) 

List II

(1) Enantiomer (2) Position isomers

(3) Metamers (4) Tautomers

Codes:

	(a)	(b)	(c)	(d)		(a)	(b)	(c)	(d)
(A)	3	2	4	1	(B)	3	2	1	4
(C)	1	2	3	4	(D)	2	3	4	1

Q.11 Arrange pH of the given compounds in decreasing order:

(1) Phenol (2) Ethyl alcohol (3) Formic acid (4) Benzoic acid

(A) 1 > 2 > 3 > 4 (B) 2 > 1 > 4 > 3 (C)3 > 2 > 4 > 1 (D) 4 > 3 > 1 > 2

Q.12 Arrange acidity of given compounds in decreasing order:

(I) $CH_3–NH–CH_2–CH_2–OH$ (II) $CH_3–NH–CH_2–CH_2–CH_2–OH$

(III) $(CH_3)_3\overset{\oplus}{N}-CH_2-CH_2-OH$

(A) III > I > II (B) III > II > I (C) I > II > III (D) II > I > III

Q.13 In each of the following pair of compounds, which is more basic in aqueous solution? Give an explanation for your choice:

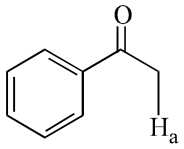
(a) CH_3NH_2 or CF_3NH_2 (b) CH_3CONH_2 or H_2N  NH_2

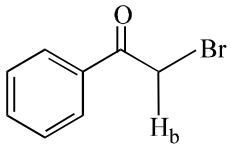
(c) n-$PnNH_2$ or CH_3CN (d) $C_6H_5N(CH_3)_2$ or 2,6-dimethyl-N-N-dimethylaniline

(e) m-nitroaniline or p-nitroaniline

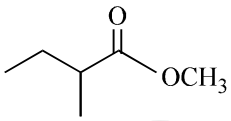
Q.14 Answer the following:

(a) Which proton is more rapidly abstracted by ethoxide ion and why?

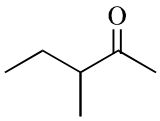




(b) Which compound is more rapidly attacked by a nucleophile and why?



or



(i) (ii)

Q.15 From the following pair, select the stronger base:

(a) p-methoxy aniline or p-cyanoaniline (b) pyridine or pyrrole

(c) CH_3CN or $CH_3CH_2NH_2$

Q.16 Write equations showing the Lewis acid-base reaction that takes place when

(a) Methyl alcohol reacts with BF_3. (b) Methyl chloride reacts with $AlCl_3$.

(c) Dimethyl ether reacts with BF_3.

Q.17 Which of the following are lewis acids & which are lewis bases?

(a) $CH_3CH_2-\dot{\underset{\displaystyle CH_3}{\underset{|}{N}}}-CH_3$ (b) $CH_3-\overset{\displaystyle CH_3}{\overset{|}{\underset{\displaystyle CH_3}{\underset{|}{C^{\oplus}}}}}$ (c) $(C_6H_5)_3P$:

(d) $:\ddot{Br}:^{-}$ (e) $(CH_3)_3B$ (f) H^{-}

Q.18 Which would you expect to be the stronger acid? Explain your reasoning in each instance.

(a) CH_2ClCO_2H or $CHCl_2CO_2H$ (b) CCl_3CO_2H or $CHCl_2CO_2H$

(c) CH_2FCO_2H or $CH_2FCH_2CO_2H$

Q.19 Write equations for the acid base reaction that would occur when each of the following compounds or solution are mixed. In each case label the stronger acid & stronger base,& the weaker acid & weaker base.

(a) NaH is added to CH_3OH

(b) $NaNH_2$is added to CH_3CH_2OH

(c) Gaseous NH_3 is added to ethyl lithium in hexane

(d) NH_4Cl is added to $NaNH_2$ in liq. NH_3

(e) $(CH_3)_3CONa$ is added to H_2O

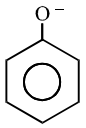
(f) NaOH is added to $(CH_3)_3$ C-OH

(g) C_2H_5OH is added to a solution of $HC\equiv C^{-}Na^{+}$ in liquid NH_3.

Q.20 $CH_3CH_2MgBr + CH_3C \equiv CH \longrightarrow A + B$

Q.21 Choose the member of each of the following pairs of compunds that is likely to be the stronger base.

(a) NH_2^- or NH_3 (b) OH^- or H_2O (c) OH^- or SH^-

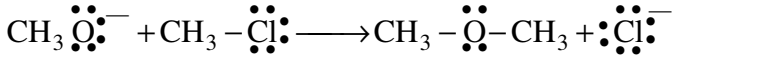
(d) $CH_3CH_2O^-$ or  (e) $CH_2(=O)-C-OH$ or $CH_3CH_2O^-$ (f) NH_3 or $NH_4^{\oplus}$

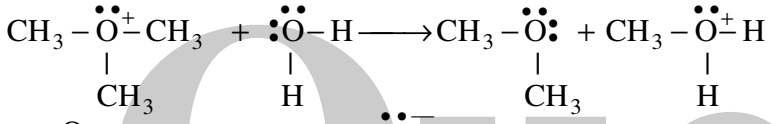
Q.22 Choose the member of each of the following pairs of compunds that is likely to be the weaker base.

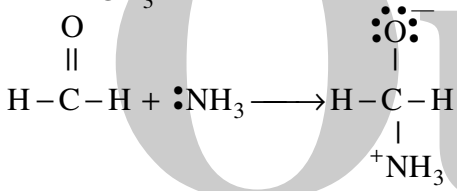
(a) H_2O or $H_3O^{\oplus}$ (b) H_2S, HS^-, S^{2-} (c) Cl^-, SH^-

(d) F^-, OH^-, NH_2^-, CH_3^- (e) HF, H_2O, NH_3 (f) OH^-, SH^-, SeH^-

Q.23 Label the reactants in these acid – base reactions as Lewis acids (electrophiles) or Lewis bases (nucleophiles). Use curved arrows to show the movement of electron pairs in the recations.

(a) 

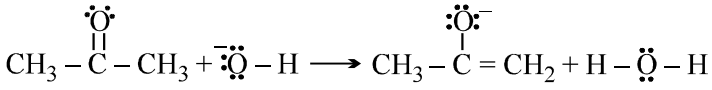
(b) 

(c) 

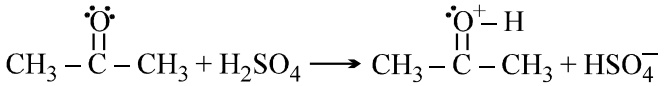
(d) 

(e) $(CH_3)_3CCl + AlCl_3 \longrightarrow (CH_3)_3C^+ + {}^-AlCl_4$

(f) $CH_2 = CH_2 + BF_3 \longrightarrow \overline{B}F_3 - CH_2 - \overset{+}{C}H_2$

(g) 

(h) $\overline{B}F_3 - CH_2 - \overset{+}{C}H_2 + CH_2 = CH_2 \longrightarrow \overline{B}F_3 - CH_2 - CH_2 - CH_2 - \overset{+}{C}H_2$

(i) 

Q.24 Predict the products of the following acid_base reactions.

$H_2SO_4 + CH_3COO^-$ l

Q.25 Methyllithium (CH_3Li) is often used as a base in organic reactions.

(a) Predict the products of the following acid – base reaction.

$CH_3CH_2 - OH + CH_3 - Li \longrightarrow$

(b) What is the conjugate acid of CH_3Li ? Would you expect CH_3Li to be a strong base or a weak base ?

Q.26 Which reagent in each pair listed here would be the more reactive Nu in a protic solvent ?

(a) CH_3NH^- or CH_3NH_2 (b) H_2O or $H_3O^{\oplus}$

(c) CH_3O^- or CH_3COO^- (d) CH_3SH or CH_3OH

(e) Ph_3N or Ph_3P (f) CH_3COO^- or ^-OH

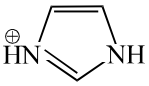
(g) H_2S or HS^- (h) NH_3 or $NH_4^{\oplus}$

Q.27 Arrange the following compounds in order of increasing basicity.

(a) CH_3NH_2, $CH_3NH_3^{\oplus}$, CH_3NH^- (b) CH_3O^-, CH_3NH^-, $CH_3CH_2^-$

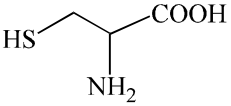
(c) $CH_3CH = CH^-$, $CH_3CH_2CH_2^-$, $CH_3C{\equiv}C^-$

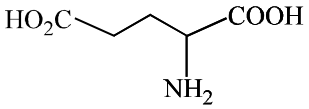
Q.28 Suggest what species would be formed by each of the following combinations :

(a) $PhO^- + CH_3COOH$ (b)  + CH_3O^-

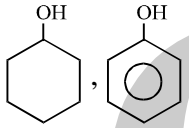
(c) Pyridinium ion + trifluoroacetate ion

Q.29 Say which pk_a belong to which functional group in case of following amino acids :

(i) cysteine :  1.8, 8.3 & 10.8

(ii) glutamic acid :  : 2.19, 4.25, 9.67

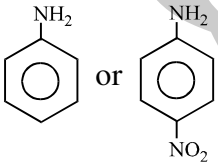
Q.30 Record the following sets of compounds according to increasing pK_a (= – log Ka)

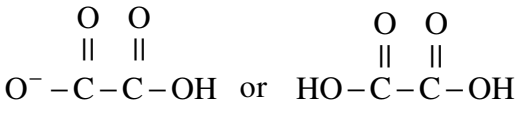
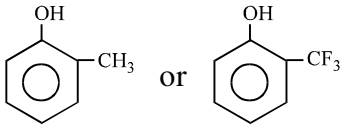
(a)  , cyclohexane carboxylic acid. (b) 1-butyne, 1-butene, butane

(c) Propanoic acid, 3-bromopropanoic acid, 2-nitropropanoic acid

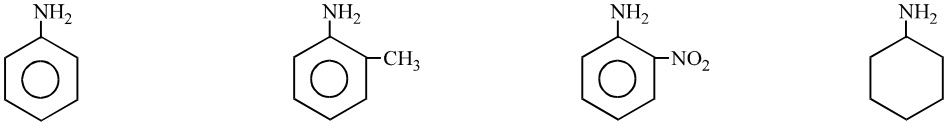
(d) Phenol,o-nitrophenol, o-cresol (e) Hexylamine, aniline, methylamine

Q.31 Explain which compound is the weaker base.

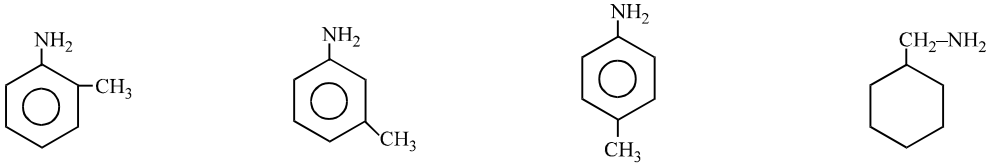
(a)  (b) $CH_2 = CH - CH = CH - CH_2^-$ or $CH_2 = CH - CH_2^-$

(c)  (d) 

Q.32 Rank the following amines in increasing basic nature.

(a) 

(i) (ii) (iii) (iv)

(b) 

(i) (ii) (iii) (iv)

(c) 

(i) (ii) (iii)

Q.33 Dimethyl furmamide (DMF) is an example of polar aprotic solvent, aprotic meaning it has no hydrogen atoms attached to highly electronegative atoms.

(a) Draw what you predict to be its most important resonance forms.

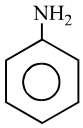
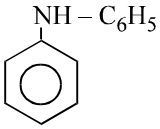
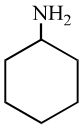
(b) DMF when used as the reaction solvent, greatly enhances the reactivity of nucleophiles. e.g.
$NaCN + CH_3CH_2Br \longrightarrow CH_3CH_2\ C \equiv N + NaBr$
Suggest an explanation for this effects.

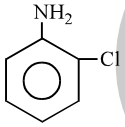
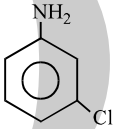
Q.34 Arrange the basic strength of the following compounds.

(a) OH^- CH_3COO^- Cl^-
(i) (ii) (iii)

(b) $CH \equiv C^-$ $CH_2 = CH^-$ $CH_3CH_2^-$
(i) (ii) (iii)

(c) $CH_2 = CHCH_2NH_2$ $CH_3CH_2CH_2NH_2$ $CH \equiv C - CH_2NH_2$
(i) (ii) (iii)

(d)

(i)

(ii)

(iii)

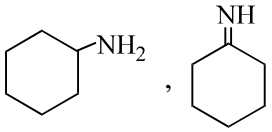
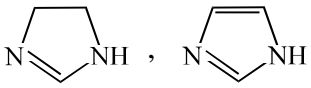
(e)

(i)

(ii)

(iii)

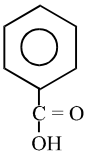
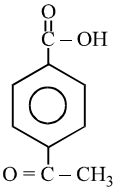
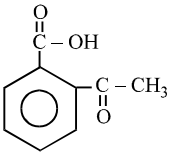
(f) Cl^- $RCOO^-$ OH^- RO^- NH_2^-
(i) (ii) (iii) (iv) (v)

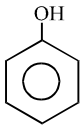
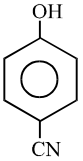
Q.35 Set the following in increasing order of pk_b :

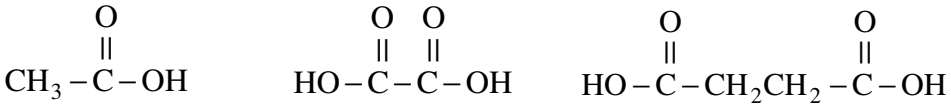
(i) CH_3NH_2 , $(CH_3)_2NH$, $(CH_3)_3N$, NH_3 [In aqeous medium]

(ii)

(iii)


Q.36 Arrange the following in increasing acid strength :

(a)

(i)

(ii)

(iii)

(b)

(i)
$CH_3 - OH$
(ii)

(iii)

(c) 

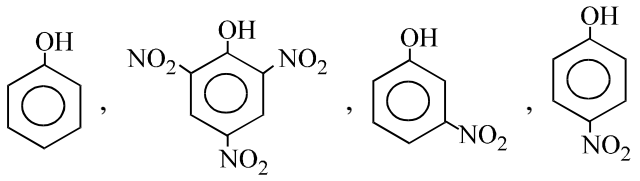
(i) (ii) (iii)

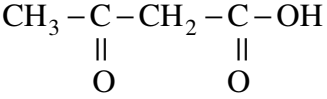
Q.37 Set the following in increasing order of pk_a:

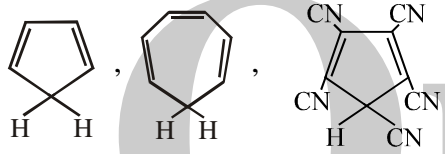
(i) Methane sulfonic acid, acetic acid & methanol.

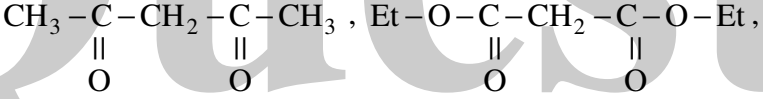
(ii) $CH_3 - CH_2 - CH_3$, $CH_2 = CH - CH_3$, $CH_3 - CHO$, $CHO - CH_2 - CHO$, CH_4

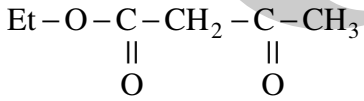
(iii) CH_3NO_2 , $(NO_2)_2 - CH_2$, $(NO_2)_3 - CH$

(iv) 

(v) CH_3COOH , $NO_2 - CH_2 - COOH$, 

(vi) 

(vii) $CHO - CH_2 - CHO$, 

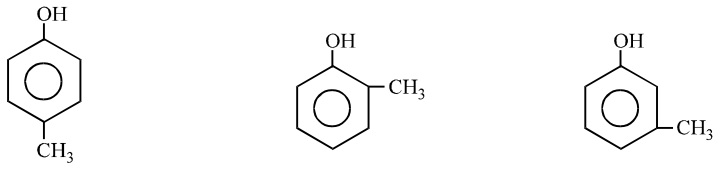


Q.38 Cyanic acid (HO–C≡N) & isocyanic acid (H–N=C=O) differ in the positions of their electrons but their structure do not represent resonance structures.

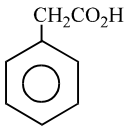
(a) Explain

(b) Loss of a proton from cyanic acid yields the same anion as that obtained by loss of a proton from isocyanic acid. Explain.

Q.39 Arrange the increasing order of acidic strength of the following compounds.

(a) 

(i) (ii) (iii)

(b)  $CH_2=CH-CH_2CO_2H$ $CH_3CH_2CO_2H$

(i) (ii) (iii)

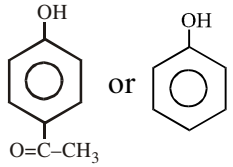
(c) CH_3OH CF_3OH CCl_3-OH

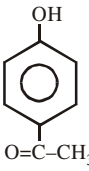
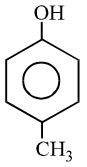
(i) (ii) (iii)

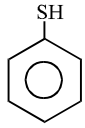
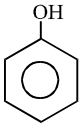
Q.40 Explain which is a stronger acid.

(a) CH_3CH_3 $BrCH_2NO_2$

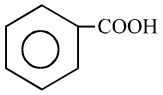
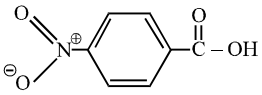
(b) $CH_3-\overset{\overset{O}{\|}}{C}-CH_3$ & $CH_3-\overset{\overset{O}{\|}}{C}-CH_2CN$

(c)  or

(d)  or 

(e)  or 

Q.41 Which of the following would you predict to be the stronger acid ?

(a)  or 

(b) $CH_3 - CH_2 - CH_2 - OH$ or $CH_3 - CH = CH - OH$

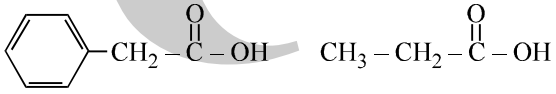
(c) $CH_3 - CH = CH - CH_2 - OH$ or $CH_3 - CH = CH - OH$

Q.42 Which is a stronger base? & Why.

(a) ethylamine or aniline (b) ethylamine or ethoxide ion

(c) phenoxide ion or ethoxide ion (d) cyclohexylamine or aniline

Q.43 The K_a of phenylacetic acid is 5.2×10^{-5}, and the pK_a of propionic acid is 4.87.



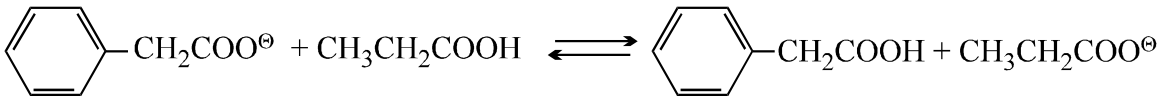
phenylacetic acid, $K_a = 5.2 \times 10^{-5}$

propionic acid, $pK_a = 4.87$

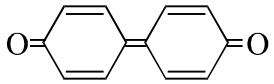
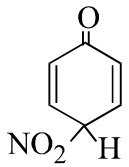
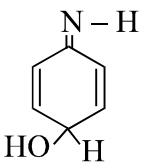
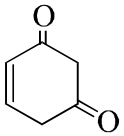
(a) Calculate the pK_a of phenylacetic acid and the K_a of propionic acid.

(b) Which of these is the stronger acid?

(c) Predict whether the following equilibrium will favor the reactants or the products.

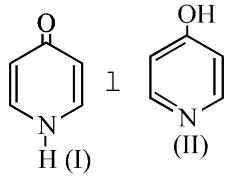


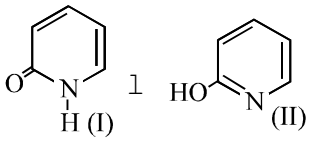
Q.44 Which of the following system show H–bonding during tautomerism.

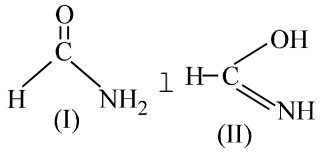
(a)  (b)  (c)  (d) 

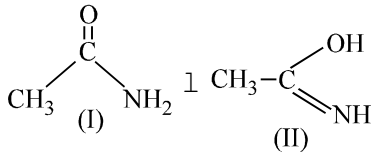
Q.45 What is the attacking site of conjugate base of triketo form of phloroglucinol in protic & aprotic solvent.

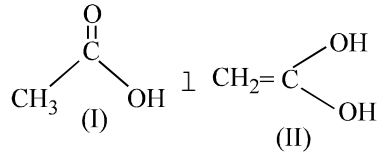
Q.46 In each of the following pairs which is more stable :

(a) 

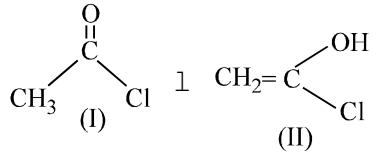
(b) 

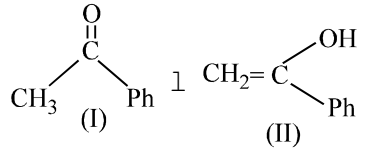
(c)  (I) (II)

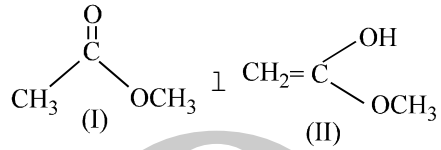
(d)  (I) (II)

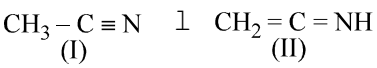
(e)  (I) (II)

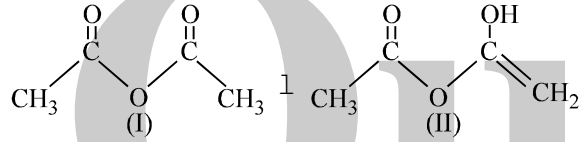
Q.47 In each of the following pairs which is less stable :

(a)  (I) (II)

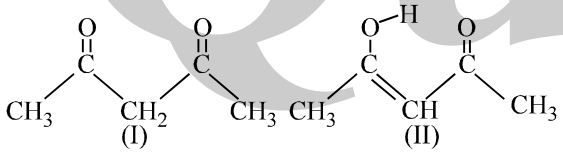
(b)  (I) (II)

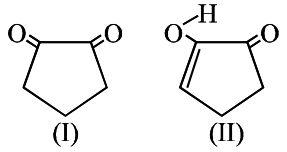
(c)  (I) (II)

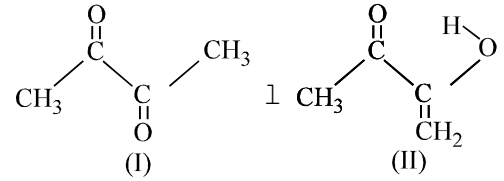
(d)  (I) (II)

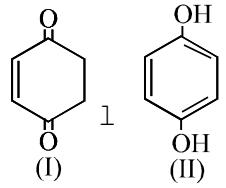
(e)  (I) (II)

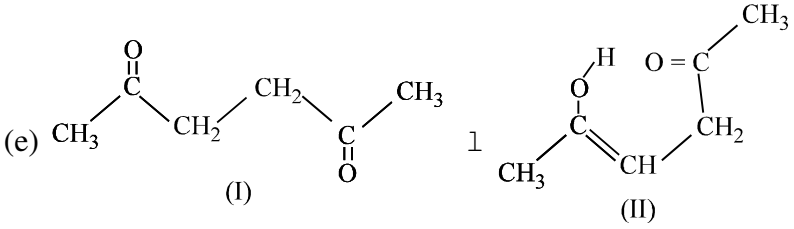
Q.48 In each of the following pairs which is more stable :

(a)  (I) (II)

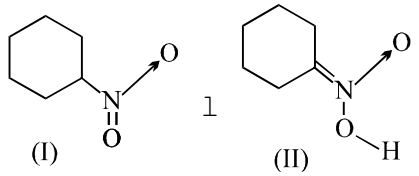
(b)  (I) (II)

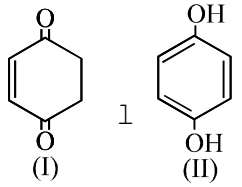
(c)  (I) (II)

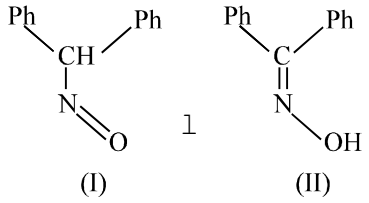
(d)  (I) (II)

(e)  (I) (II)

Q.49 In each of the following pairs which is less stable :

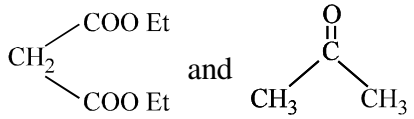
(a)  (I) (II)

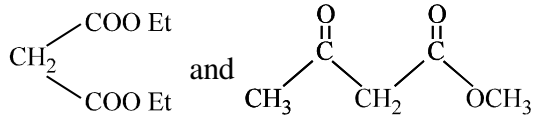
(b)  (I) (II)

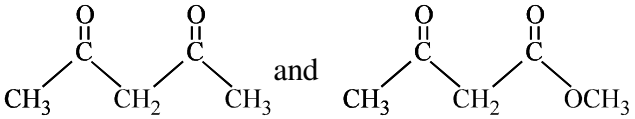
(c)  (I) (II)

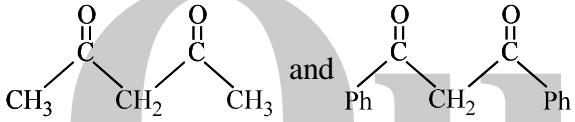
(d) $CH_2 = CH - NH_2$ ⥊ $CH_3 - CH = NH$ (I) (II)

Q.50 In each of the following pairs which will have higher enol content :

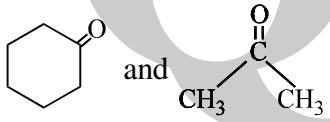
(a) 

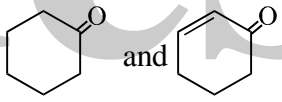
(b) 

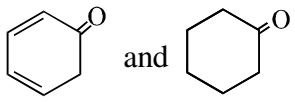
(c) 

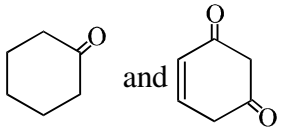
(d) 

Q.51 In each of the following pairs which will have less enol content :

(a) 

(b) 

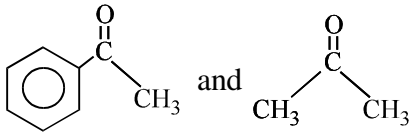
(c) 

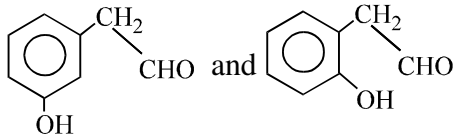
(d) 

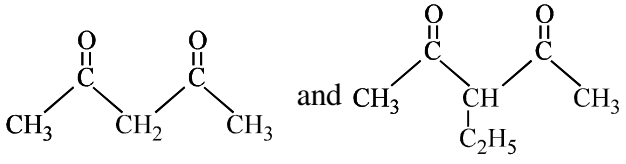
(e) $\underset{\underset{Cl}{|}}{CH_2 - CHO}$ and $CH_3 - CHO$

Q.52 In each of the following pairs which will have higher enol content :

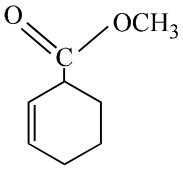
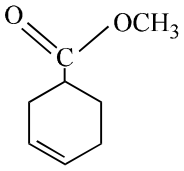
(a) $\underset{\underset{NO_2}{|}}{CH_2 - CHO}$ and $\underset{\underset{Cl}{|}}{CH_2 - CHO}$

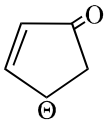
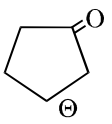
(b) 

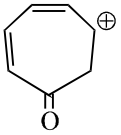
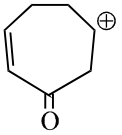
(c) 

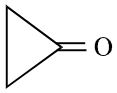
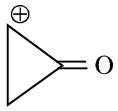
(d) 

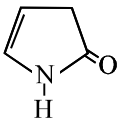
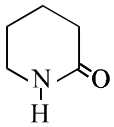
Q.53 In each of the following pairs which will have less enol content :

(a)  and 

(b)  and 

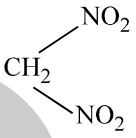
(c)  and 

(d)  and 

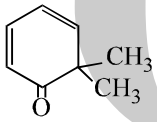
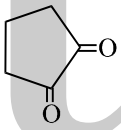
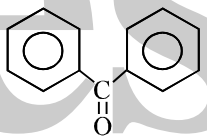
(e)  and 

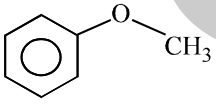
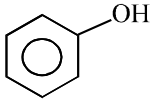
Q.54 Which of the following compounds can exhibit tautoimerism :

(a) $CH_2 = C = O$ (b) $CH_2 = CH - OH$ (c) $HO - CH = CH - OH$

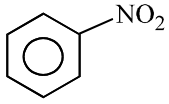
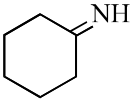
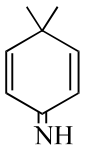
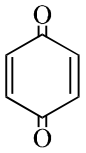
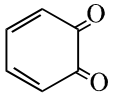
(d) CH_3CN (e) 

Q.55 Which of the following compounds can not exhibit tautoimerism :

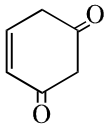
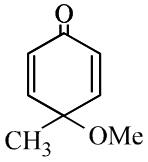
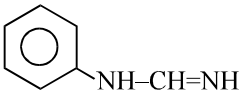
(a)  (b)  (c) 

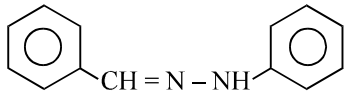
(d)  (e) 

Q.56 Which of the following compounds can exhibit tautoimerism :

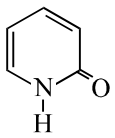
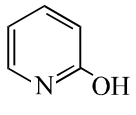
(a)  (b)  (c)  (d)  (e) 

Q.57 Which of the following compounds can not exhibit tautoimerism :

(a)  (b)  (c) 

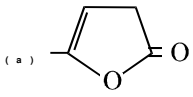
(d)  (e) $CH_3 - NO$

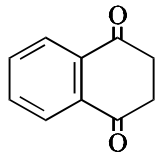
Q.58 What is the relationship between these two molecules? Discuss the structure of the anion that would be formed by the deprotonation of each compound.

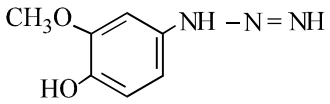
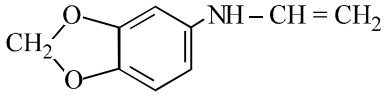
 

Q.59 Write down tautomeric structure of 5,5 – dimethylcyclohexane –1,3 –dione (dimedone).

Q.60 Draw enol forms of these carbonyl compounds and comment on the stability of the enol forms.

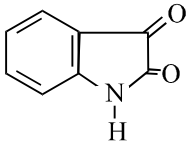
(a) 

(b) 

Q.61 (a)  and (b) 

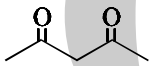
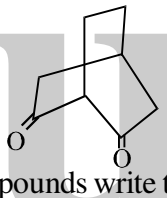
Shows tautomeric forms of (a) & (b).

Q.62 Isatin was the first compound to show tautomerism.

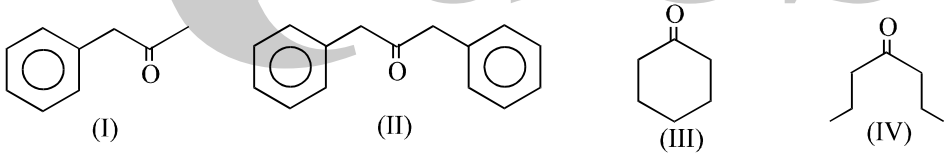


What is the tautomeric form of isatin.

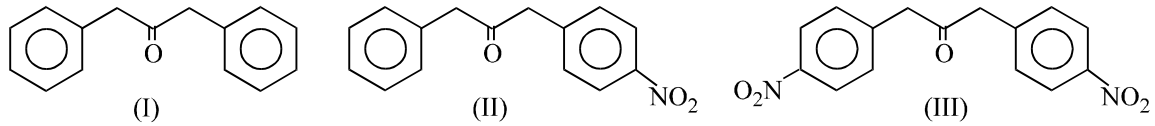
Q.63 1, 3 – dicarbonyl compounds such as (A) are usually mostly enolized. Why is this ? Draw the enols available to compounds A & B comment on the different pattern of enolization.

(A)  (B) 

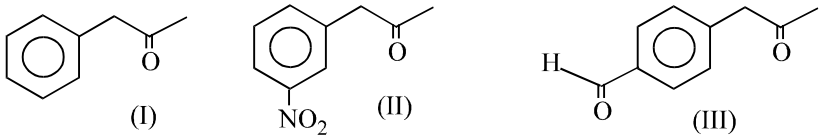
Q.64 In each of the following sets of compounds write the increasing order of % enol content

(a) 

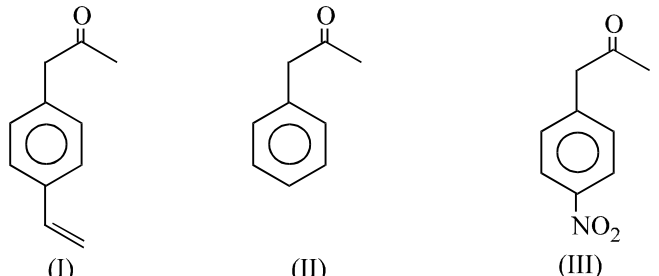
(I) (II) (III) (IV)

(b) 

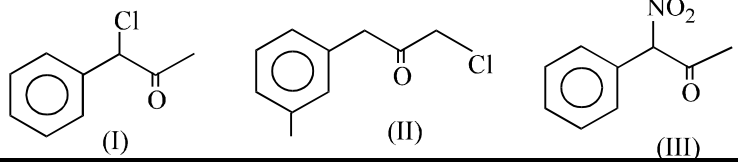
(I) (II) (III)

(c) 

(I) (II) (III)

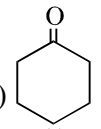
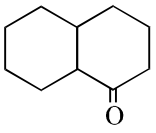
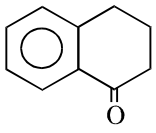
(d) 

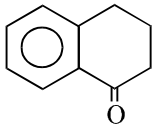
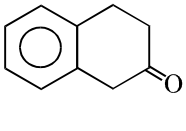
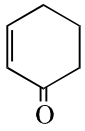
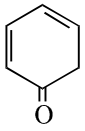
(I) (II) (III)

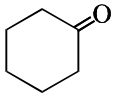
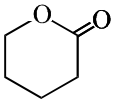
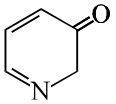
(e) 

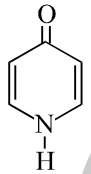
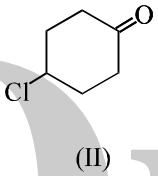
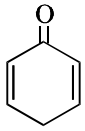
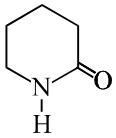
(I) (II) (III)

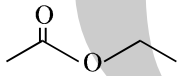
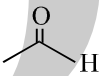
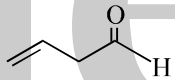
Q.65 In each of the following sets of compounds write the decreasing order of % enol content.

(a)  (I)  (II)  (III)

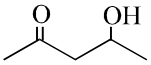
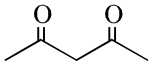
(b)  (I)  (II)  (III)  (IV)

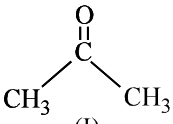
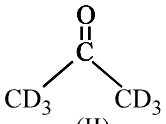
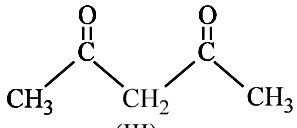
(c)  (I)  (II)  (III)  (IV)

(d)  (I)  (II)  (III)  (IV)

(e)  (I)  (II)  (III)  (IV)

Q.66 Out of enol form of cyclobutanone and enol form of triketocyclobutane, which is more stable? Give reason also.

Q.67  has lower boiling point than  even when former has – OH group. Explain.

Q.68  (I)  (II)  (III)

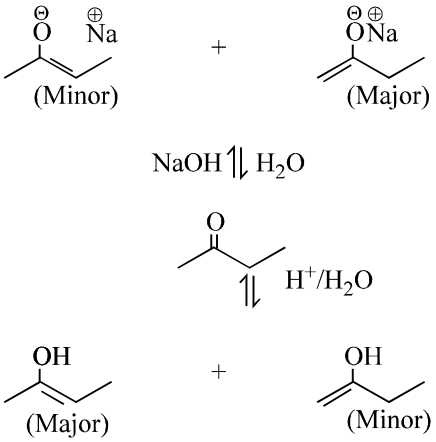
Among these give ease of enolization.

Q.69 % enol content of acetylacetone in following solvents is found as :

Solvent	% enol content
H_2O	15
Liquid state	76
hexane	92
gas phase	92

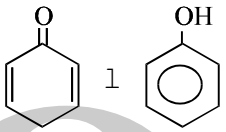
Explain the observation.

Q.70



Explain the observation.

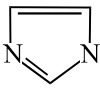
Q.71

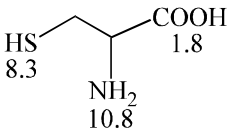


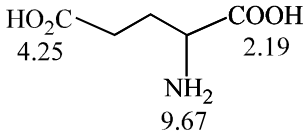
This tautomeric system exist almost exclusively in favour of phenol and it is insensitive to change in solvent.

ANSWER KEY

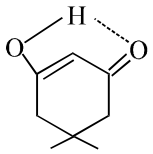
Q.1 B Q.2 C Q.3 D Q.4 B Q.5 C Q.6 B Q.7 A
Q.8 A Q.9 A Q.10 A Q.11 B Q.12 A
Q.13 (a) i, (b) ii, (c) i, (d) ii, (e) i Q.14 (a) H b, (b) ii Q.15 (a) i, (b) i, (c) ii
Q.17 LA b,e LB acdf Q.18 (a) 2; (b) 1; (c) 1
Q.20 $CH_3CH_3 + CH_3C \equiv CMgBr$ Q.21 (a) 1; (b) 1; (c) 1; (d) 1; (e) 2; (f) 1
Q.22 (a) 2; (b) 1; (c) 1; (d) 1; (e) 1; (f) 3 Q.26 (a) 1; (b) 1; (c) 1; (d) 1; (e) 2; (f) 2; (g) 2; (h) 1
Q.27 (a) 2<1<3; (b) 1<2<3; (c) 3<1<2

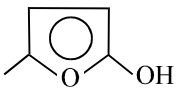
Q.28 (a) PhOH + $AcO^{\ominus}$, (b) MeOH +  , (c) no reaction

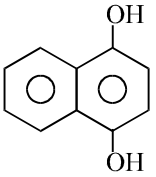
Q.29 (i) cysteine : 

(ii) glutamic acid : 

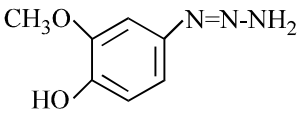
Q.30 (a) 3<2<1; (b) 1<2<3; (c) 3<2<1; (d) 2<1<3; (e) 2<3<1 Q.31 (a) 2; (b) 1; (c) 2; (d) 2
Q.32 (a) 3<2<1<4; (b) 1<2<3<4; (c) 3<1<2
Q.34 (a) 1>2>3; (b) 1<2<3; (c) 3<1<2; (d) 2<1<3; (e) 1<2<3; (f) 1<2<3<4<5
Q.35 (i) 4>3>1>2; (ii) 1<2; (iii) 1<2 Q.36 (a) 1<2<3; (b) 3>1>2; (c) 1<3<2
Q.37 (i) 1<2<3; (ii) 1>5>2>3>4; (iii) 1>2>3; (iv) 1>3>4>2; (v) 1>3>2; (vi) 2>1>3; (vii) 3>4>2>1
Q.39 (a) 3>1>2; (b) 1>2>3; (c) 2>3>1 Q.40 (a) 2; (b) 2; (c) 1; (d) 1; (e) 1
Q.41 (a) 2; (b) 2; (c) 2 Q.42 (a) 1; (b) 2; (c) 2; (d) 1
Q.43 (a) 4.25, (b) 1.34×10^{-5}, (c) reactant Q.46 (a) 2; (b) 2; (c) 1; (d) 1; (e) 1
Q.47 (a)2; (b) 2; (c) 2; (d) 2; (e) 1 Q.48 (a) 2; (b) 2; (c) 1; (d) 2; (e) 1
Q.49 (a) 2; (b) 1; (c) 1; (d) 1 Q.50 (a)1; (b) 2; (c)1; (d) 2
Q.51 (a) 2; (b) 1; (c) 2; (d) 1; (e) 2 Q.52 (a) 1; (b) 1; (c) 1; (d) 1
Q.53 (a) 2; (b) 2; (c) 2; (d) 1; (e) 2 Q.54 a, b, c, d, e
Q.55 a, c, d Q.56 b
Q.57 b Q.58 Tautamers

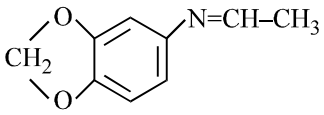
Q.59 

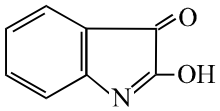
Q.60 (a) 

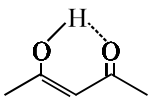
(b) 

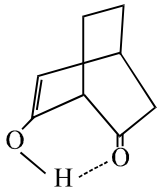
both are more stable

Q.61 (a) 

(b) 

Q.62 

Q.63 (A) 

(B) 

Q.64 (a) 2>1>3>4; (b) 3>2>1; (c) 3>2>1; (d) 3>1>2; (e) 3>1>2
Q.65 (a) 3>1>2; (b) 4>2>1>3; (c) 4>3>1>2; (d) 1>3>4>2; (e) 3>2>4>1
Q.66 enol form of triketocyclobutane
Q.68 3>1>2

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CHEMISTRY

NUCLEUS

CARBONYL

CARBONYL

Q.1 Which one of the following is mixed ketone:

(A) $CH_3-\overset{\overset{O}{\|}}{C}-CH_3$

(B) $CH_3-CH_2-\overset{\overset{O}{\|}}{C}-CH_3$

(C) $C_6H_5-\overset{\overset{O}{\|}}{C}-CH_3$

(D) $\underset{(P)}{CH_3-C_6H_4}-\overset{\overset{O}{\|}}{C}-C_6H_5$

Q.2 In which of the following reactions product will be aldehyde?

(A) $CH_3-\underset{\underset{CH_3}{|}}{C}=\underset{\underset{CH_3}{|}}{C}-C_2H_5 \xrightarrow[(ii)\,H_2O/Zn]{(i)\,O_3}$

(B) $CH_3–CH=CH_2 \xrightarrow[\Delta]{CO/H_2/CO_2(CO)_8}$

(C) $CH_3–CH=CH_2 \xrightarrow[NaOH,H_2O_2]{B_2H_6}$

(D) $CH_3–C\equiv CH \xrightarrow{HOH/HgSO_4/H_2SO_4}$

Q.3 Gem dihalide on hydrolysis gives:
(A) Vic diol (B) Gem diol
(C) Carbonyl compound (D) Carboxylic acid

Q.4 Which one of the following alcohols cannot be oxidised by K_2CrO_4?
(A) Ethanol (B) Tert butyl alcohol (C) Isopropyl alcohol (D) Allyl alcohol

Q.5 In the given reaction:

$$CH_3-\underset{\underset{OH}{|}}{CH}-\underset{\underset{OH}{|}}{\underset{\underset{CH_3}{|}}{C}}-CH_3 \xrightarrow{HIO_4} (a) + (b)$$

(a) and (b) respectively be:
(A) CH_3CHO and CH_3CHO (B) CH_3COCH_3 and CH_3CHO
(C) CH_3COCH_3 and CH_3COCH_3 (D) CH_3COOH and CH_3COCH_3

Q.6 Acetophenone can be obtained by the distillation of:
(A) $(C_6H_5COO)_2Ca$ (B) $(CH_3COO)_2Ca$
(C) $(C_6H_5COO)_2Ca$ and $(CH_3COO)_2Ca$ (D) $(C_6H_5COO)_2Ca$ and $(HCOO)_2Ca$

Q.7 Arrange these compounds in decreasing order of reactivity for the nucleophilic addition reaction:
(I) Acid chloride (II) Aldehyde (III) Ketone (IV) Ester
Select the correct answer from the codes given below:
(A) I > II > III > IV (B) IV > III > II > I (C) III > II > I > IV (D) I > IV > II > III

Q.8 Two isomeric ketones, 3-pentanone and 2-pentanone can be distinguished by :
(A) I_2 / NaOH only (B) $NaSO_3H$ only (C) NaCN / HCl (D) Both (A) and (B)

Q.9 Acetal or ketal is:
(A) Vic dialkoxy compound (B) α, ω-dialkoxy compound
(C) α-alkoxy alcohol (D) Gem dialkoxy compound

Q.10 In the given reaction

$$CH_3-CH_2-\overset{\overset{O}{\|}}{C}-CH_2COOC_2H_5 \xrightarrow{[X]} (A) \xrightarrow[(ii)\,H_2O/H^{\oplus}]{(i)\,LiAlH_4} CH_3-CH_2-\overset{\overset{O}{\|}}{C}-CH_2-CH_2OH + C_2H_5OH$$

[X] will be:

(A) HCHO

(B) $\begin{matrix} CH_2-OH \\ | \\ CH_2OH \end{matrix} + H^{\oplus}$

(C) $\begin{matrix} CH_2-OH \\ | \\ CH_2-OH \end{matrix} + \overset{\ominus}{O}H$

(D) HCN

Q.11 Consider the structure of given alcohol:

$$C_6H_5-\overset{\overset{OH}{|}}{\underset{\underset{C_2H_5}{|}}{C}}-CH_3$$

This alcohol can be prepared from:

(A) $C_6H_5-\overset{\overset{O}{\|}}{C}-CH_3$ and C_2H_5MgBr

(B) $CH_3-CH_2-\overset{\overset{O}{\|}}{C}-CH_3$ and C_6H_5MgBr

(C) $C_6H_5-\overset{\overset{O}{\|}}{C}-C_2H_5$ and CH_3MgBr

(D) All of these

Q.12 Stability of gemdiol depends on:

(A) Steric hindrance

(B) Presence of –I group on gemdiol carbon

(C) Intramolecular hydrogen bonding

(D) All of these

Q.13 In the reaction sequence:

$$C_6H_5-\overset{\overset{O}{\|}}{C}-CH_3 \xrightarrow{NH_2OH/H^{\oplus}} [X] \xrightarrow{PCl_5} [Y]$$

[Y] will be:

(A) $C_6H_5-\overset{\overset{O}{\|}}{C}-NHCH_3$

(B) $CH_3-\overset{\overset{O}{\|}}{C}-NH-C_6H_5$

(C) $C_6H_5-CH_2-\overset{\overset{O}{\|}}{C}-NH_2$

(D) Mixture of (A) and (B)

Q.14 In the given reaction:

$$C_6H_5-\underset{\underset{O}{\|}}{C}-H \xrightarrow{NH_2OH/H^{\oplus}} [X]$$

[X] will be:

(A) Only syn oxime
(B) Only anti oxime
(C) mixture of syn and anti oxime
(D) secondary amide

Q.15 Schiff's base is prepared from:

(A) Carbonyl compound and primary amine
(B) Carbonyl compound and secondary amine
(C) Carbonyl compound and tertiary amine
(D) All of these

Q.16 Schiff's reagent is used for the differentiation between:

(A) HCHO and CH_3CHO

(B) CH_3COCH_3 and CH_3CHO

(C) $C_6H_5-CH_2-\overset{\overset{O}{\|}}{C}-CH_3$ and $C_6H_5-\overset{\overset{O}{\|}}{C}-CH_2-CH_3$

(D) HCHO and C_6H_5CHO

Q.17 Fehling solution gives red precipitate with:

(A) Aromatic aldehyde
(B) Saturated aliphatic aldehyde
(C) Unsaturated aliphatic aldehyde
(D) Both (B) and (C)

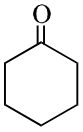
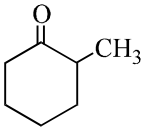
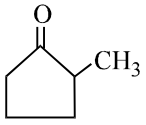
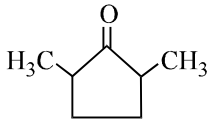
Q.18 Silver mirror test with Tollens reagent is given by :

(A) C_6H_5CHO
(B) $CH_2=CH-CHO$
(C) $C_6H_5-CH=CH-CHO$
(D) All of these

Q.19 In the reaction sequence, [X] is ketone :

$$[X] \xrightarrow{KMnO_4/\overset{\ominus}{O}H/\Delta} HOOC-(CH_2)_3-\underset{\underset{CH_3}{|}}{CH}-COOH$$

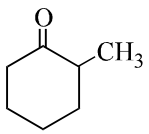
[X] will be:

(A) 
(B) 
(C) 
(D) 

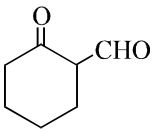
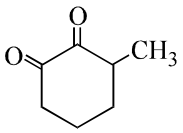
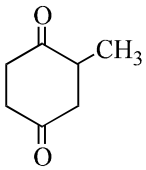
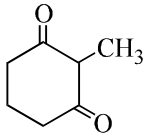
Q.20 Which one of the following compounds will give dimethyl glyoxal with SeO_2:

(A) Acetone (B) Acetophenone (C) Ethyl methyl ketone (D) Propanaldehyde

Q.21 In the given reaction


$\xrightarrow{SeO_2}$ [X]

[X] will be:

(A) 
(B) 
(C) 
(D) 

Q.22 Consider the given reaction :

$$CH_3-\overset{\overset{O}{\|}}{C}-CH_3 \xrightarrow{C_6H_5COOOH} CH_3-\overset{\overset{O}{\|}}{C}-O-CH_3$$

The above reaction is known as :

(A) Baeyer-villiger oxidation (B) Oppenaur oxidation

(C) Periodate oxidation (D) Peroxide oxidation

Q.23 Acetone can be converted into pinacol by :

(A) $Mg/Hg/H_2O$ (B) $Zn/Hg/HCl$ (C) $Na/Hg/H_2SO_4$ (D) All of these

Q.24 Arrange acidity of given four compounds in decreasing order:

(I) $CH_3-\overset{\overset{O}{\|}}{C}-CH_2-\overset{\overset{O}{\|}}{C}-CH_3$ (II) $CH_3-\overset{\overset{O}{\|}}{C}-CH_3$ (III) CH≡CH (IV) CH_3–CHO

Select correct answer from the codes given below:

Codes:

(A) I > IV> III > II (B) I > IV > II >III (C) III > I > IV > II (D) II > IV > I > III

Q.25 Which one of the following compounds will not give aldol:

(A) CH_3CHO (B) $CH_3–CH_2–CHO$

(C) $CH_3-CH_2-\overset{\overset{O}{\|}}{C}-CH_3$ (D) C_6H_5CHO

Q.26 In the given reaction

$$X + Y \xrightarrow[5°C]{NaOH} CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{OH}{|}}{CH}}-CH-CHO$$

(X) and (Y) will respectively be:

(A) $CH_3–CH_2–CHO$ and $CH_3–CH_2–CHO$ (B) $CH_3–CHO$ and $CH_3–CH_2–CHO$

(C) $CH_3–CHO$ and $CH_3–CHO$ (D) $CH_3–CHO$ and $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-CHO$

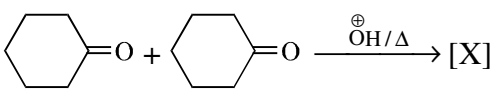
Q.27 Number of products in the given reaction :

$$C_6H_5CHO + CH_3–CHO \xrightarrow{\overset{\ominus}{O}H} \text{Product}$$

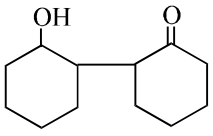
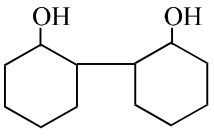
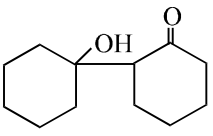
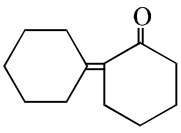
will be

(A) One (B) Three (C) Two (D) Four

Q.28 In the reaction :



[X] will be :

(A)  (B)  (C)  (D) 

Q.29 Perkin reaction is catalysed by :

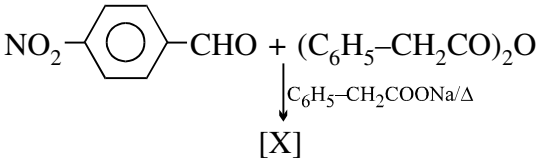
(A) NaOH (B) HCl (C) NH_4Cl (D) Pyridine

Q.30 Product of Perkin reaction is:

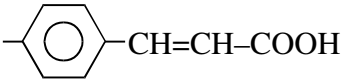
(A) α, β-unsaturated aldehyde (B) β-cyclohexyl α, β-unsaturated aldehyde

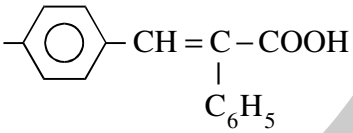
(C) β-Aryl-α, β-unsaturated acid (D) All of these

Q.31 The product of the reaction:

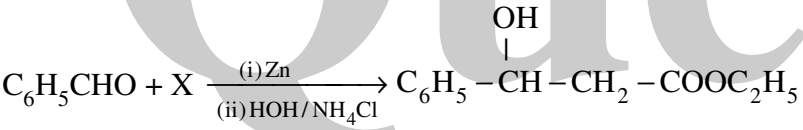


will be :

(A) $C_6H_5–CH=CH–COOH$ (B) 

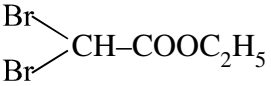
(C)  (D) 

Q.32 In the given reaction

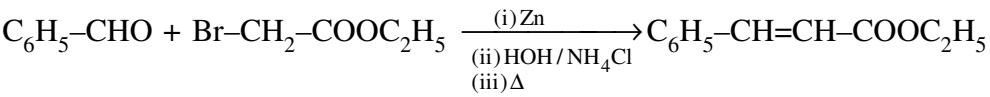


[X] will be:

(A) $CH_3–COOC_2H_5$ (B) $CH_3–CH_2–COOC_2H_5$

(C) $Br–CH_2–COOC_2H_5$ (D) 

Q.33 The given reaction



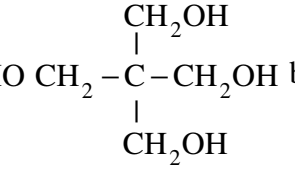
is known as :

(A) Perkin reaction (B) Knoevenagel reaction

(C) Reformatsky reaction (D) Claisen-Schmidt reaction

Q.34 Cannizzaro reaction is example of :

(A) Redox reaction (B) Disproportionation (C) Both (A) and (B) (D) Only oxidation

Q.35 Acetaldehyde can be converted into  by which reagent?

(A) KOH (B) KOH followed by LAH

(C) excess of HCHO and KOH (D) KCN followed by SBH

Q.36 Metaformaldehyde is:
(A) Dimmer of HCHO
(B) Trimer of formaldehyde
(C) Tetramer of formaldehyde
(D) Polymer in which number of HCHO unit is more than 100

Q.37 In the given reaction :

$$CH_3-\overset{\overset{O}{\|}}{C}-CH_3 \xrightarrow[\text{Distillation}]{\text{Conc.}H_2SO_4} [X]$$

[X] will be :
(A) Methyl oxide
(B) Phorone
(C) 1, 3, 5-Trimethylbenzene
(D) 2-Butyne

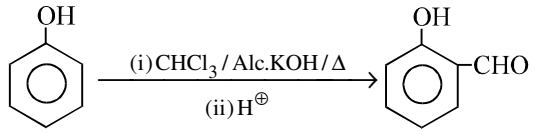
Q.38 Match list-I with list-II and select the correct answer using the codes give below the lists:

List-I	**List-II**
(a) $CH_2=CH-CHO \xrightarrow{NaBH_4}$	(i) Acetal
(b) $C_6H_5CHO + Ph-NH_2 \xrightarrow{H^\oplus}$	(ii) Schiff's base
(c) $C_6H_5COCH_3+CH_3-CH_2-NH-CH_3 \xrightarrow{H^\oplus}$	(iii) Unsaturated alcohol
(d) $RCHO + 2RCH_2OH \xrightarrow{H^\oplus}$	(iv) Enamine

Codes:

	(a)	**(b)**	**(c)**	**(d)**
(A)	(iii)	(ii)	(iv)	(i)
(B)	(iii)	(ii)	(i)	(iv)
(C)	(ii)	(iii)	(iv)	(i)
(D)	(iv)	(i)	(ii)	(iii)

Q.39 Match list-I with list-II and select the correct answer using the codes give below the lists:

List-I	**List-II**
(a) $C_6H_5CHO + HCHO \xrightarrow{\overset{\Theta}{O}H} C_6H_5CH_2OH + HCO\overset{\Theta}{O}$	(i) Cannizzaro reaction
(b) $C_6H_5-H+CH_3COCl \xrightarrow{Anhy.AlCl_3} C_6H_5-CO-CH_3$	(ii) Friedel Crafts reaction
(c) $C_6H_6+CO+HCl \xrightarrow[Cu_2Cl_2]{Anhy.ZnCl_2} C_6H_5-CHO$	(iii) Reimer-Tiemann reaction
(d) 	(iv)Gattermann-koch aldehyde synthesis

Codes:

	(a)	**(b)**	**(c)**	**(d)**
(A)	(i)	(ii)	(iii)	(iv)
(B)	(i)	(ii)	(iv)	(iii)
(C)	(i)	(iii)	(iv)	(ii)
(D)	(iv)	(ii)	(iii)	(i)

Q.40 Cross Cannizzaro reaction is an example of :
(A) Redox reaction (B) Disproportionation (C) both A & B (D) Oxidation

Q.41 Which will give silver mirror test with Tollens reagent :
(A) C_6H_5CHO (B) CH_3–CHO (C) HCOOH (D) All of these

Q.42 Which one of the combinations will give propanaldehyde on dry distillation?
(A) $(C_6H_5COO)_2Ca$ and $(HCOO)_2Ca$ (B) $(CH_3COO)_2Ca$ and $(CH_3CH_2–COO)_2Ca$
(C) $(CH_3–CH_2–COO)_2Ca$ and $(HCOO)_2Ca$ (D) $(CH_3COO)_2Ca$ and $(CH_3COO)_2Ca$

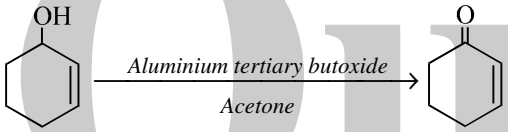
Q.43 Grignard reagents do not give carbonyl compounds with :
(A) CO_2 (B) RCOCl (C) RCN (D) RCOOR

Q.44 In the reaction sequence:

$$\text{Cyclohexane} \xrightarrow{hv/Cl_2} (X) \xrightarrow{\text{alc.KOH}/\Delta} (Y) \xrightarrow[(ii)\,H_2O/Zn]{(i)\,O_3} (Z)$$

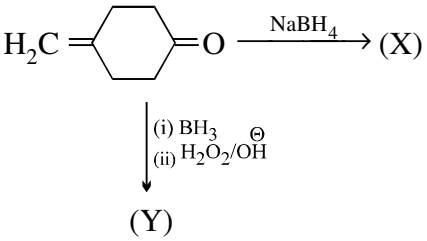
(Z) will be :
(A) Hexanal (B) 2-Hexanone (C) 3-Hexanone (D) Hexanedial

Q.45 The given reaction

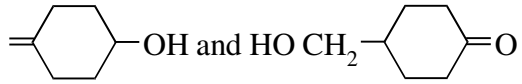


is knows as :
(A) Kolbe reaction (B) Tischenko reaction (C) MPV reaction (D) Oppeneur oxidation

Q.46 In the given reaction:

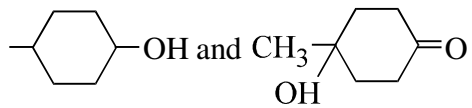


(X) and (Y) are :

(A) 

(B) 

(C) 

(D) 

Q.47 Cyanohydrin of which compound on hydrolysis will give lactic acid?
(A) C_6H_5CHO (B) HCHO (C) CH_3CHO (D) $CH_3–CH_2–CHO$

Q.48 In the reaction sequence:

$$CH_2OH–CHOH–CH_2OH \xrightarrow{KHSO_4/\Delta} (X) \xrightarrow[\Delta]{(C_2H_5O)_3Al} (Y)$$

(Y) will be:
(A) $CH_2=CH–CHO$
(B) $CH_2=CH–CH_2OH$
(C) Mixture of $CH_2=CH–COOH$ and $CH_2=CH–CH_2OH$

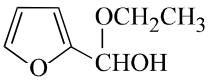
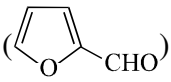
(D) $CH_2=CH-\overset{\overset{O}{\|}}{C}-O-CH_2-CH=CH_2$

Q.49 Acetaldehyde cannot give:
(A) Iodoform test (B) Lucas test (C) Benedict test (D) Tollens test

Q.50 The reaction in which $NaCN/C_2H_5OH/HOH$ is used is:
(A) Perkin reaction (B) Benzoin condensation
(C) Reimer-Tieman reaction (D) Rosenmunds reduction

Q.51 Which one of the following reactions is used for the conversion of ketone into hydrocarbons?
(A) Aldol condensation (B) W.K.reduction
(C) Reimer-Tieman reaction (D) Perkin reaction

Q.52 Schiff's reagent gives pink colour with :
(A) Acetaldehyde (B) Acetone (C) Acetic acid (D) Methyl acetate

Q.53 Compound  formed by the reaction of furfural () with ethanol is
(A) an aldol (B) an acetal (C) a ketal (D) a hemiacetal

ANSWRE KEY

Q.1 C	Q.2 B	Q.3 C	Q.4 B
Q.5 B	Q.6 C	Q.7 A	Q.8 D
Q.9 D	Q.10 B	Q.11 D	Q.12 D
Q.13 D	Q.14 C	Q.15 A	Q.16 B
Q.17 D	Q.18 D	Q.19 B	Q.20 C
Q.21 B	Q.22 A	Q.23 A	Q.24 B
Q.25 D	Q.26 B	Q.27 C	Q.28 D
Q.29 D	Q.30 C	Q.31 D	Q.32 C
Q.33 C	Q.34 A	Q.35 C	Q.36 B
Q.37 C	Q.38 A	Q.39 B	Q.40 A
Q.41 D	Q.42 C	Q.43 A	Q.44 D
Q.45 D	Q.46 A	Q.47 C	Q.48 D
Q.49 B	Q.50 B	Q.51 B	Q.52 A
Q.53 D			

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FINAL PRACTICE TEST PROBLEMS FOR JEE

(With Answers)

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SELF ASSESSMENT SPEED TEST-1

Time : 50 Min ***Max. Marks: 90***

INSTRUCTIONS

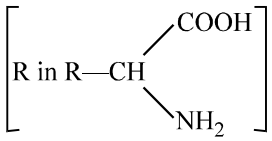
Q.1 to Q.30 *have one or more than one correct alternative(s) and carry* ***3 marks*** *each.*
There is ***NEGATIVE*** *marking and* ***1 mark*** *will be deducted for each wrong answer.*

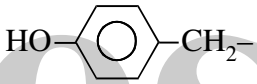
Q.1 Which of the following is not a polymide fibre
(A) Nylon-66 (B) Nylon-6 (C) Teflon (D) Terylene

Q.2 Which one of the following pairs is correctly matched:
(A) Sucrose : reducing sugar
(B) Glucose : mutarotation
(C) Fructose : aldose sugar
(D) Sucrose : monosaccharide

Q.3 Match List-I with List-II and select the correct answer using the codes given below the lists:

List-I **List-II**

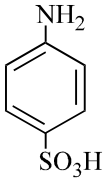
(a-amino acids) 

(a) Leucine (i) 

(b) Phenylalanine (ii) $(CH_3)_2$–
(c) Tyrosine (iii) CH_2OH–
(d) Serine (iv) C_6H_5–CH_2–

Codes:	**(a)**	**(b)**	**(c)**	**(d)**		**(a)**	**(b)**	**(c)**	**(d)**
(A)	ii	i	iv	iii	(B)	ii	iv	i	iii
(C)	iv	ii	i	iii	(D)	iv	ii	iii	i

Q.4 Which of the following will not give blue colour during the test for 'N' in sodium extract

(A) $C_6H_5N_2^{\oplus}Cl^{\ominus}$ (B) NH_2CONH_2 (C) NH_2–NH_2 (D) 

Q.5 An electric current is passed through an aqueous solution (buffered at pH = 6.0) of alanine (pI = 6.0) and ariginine (pI = 10.2). he two amino acids can be separated because
(A) alanine migrates to anode, and arginine to cathode
(B) alanine migrates to cathode, and arginione to anode
(C) alanine does not migrate, while arginine migrates to cathode
(D) alanine does nor migrate, while arginine migrates to anode

Q.6 Glucose and fructose form identical osazones because:
(A) they are monosaccharides (B) they are reducing sugars
(C) they are epimers (D) their configurations differ only at C-1 and C-2

Q.7 Which of the following is a natural polymer
(A) Nylon (B) Teflon (C) PVC (D) Cellulose

Q.8 Glucose reacts with CH_3OH to form
(A) methyl glycoside (B) ethyl glycoside
(C) methyl ester of gluconic acid (D) None of these

Q.9 2,4-Dinitrofluorobenzene is used in peptide chemistry because:
(A) it has a characteristic colour
(B) it undergoes nucleophilic substitution
(C) it undergoes electrophilic substitution
(D) it makes the amino acids insoluble in water and thus making them readily crystallisable

Q.10 Mullikan and Barkers test for the detection of the nitro group is based on
(A) the reduction of nitrobenzene by hydrogen in the presence of a catalyst like Ni/Pt
(B) the conversion of nitrobenzene to azoxy benzene
(C) the treatment of nitrobenzene with zinc dust in the neutral medium.
(D) the reduction of nitrobenzene with iron fillings and sodium hydroxide.

Q.11 In the given reaction:

$$\text{Glucose} + 3C_6H_5NH\text{–}NH_2 \xrightarrow{H^{\oplus}/\Delta} \text{Osazone} + A + B$$

(A) and (B) are:
(A) $C_6H_5NH_2$ and NH_3 (B) $C_6H_5NH_2$ and NH_2OH
(C) $C_6H_5NH - NHOH$ and NH_3 (D) NH_2OH and NHOH

Q.12 In solution D-glucose exist in how many isomeric forms?
(A) Two (B) Sixteen (C) Three (D) Four

Question No. 13 & 14 (2 questions)
These questions consist of two statements each, printed as assertion and reason, while answering these questions you are required to choose any one of the following responses.
(A) If assertion is true but the reason is false.
(B) If assertion is false but the reason is true.
(C) If both assertion and reason are true and the reason is a correct explanation of assertion.
(D) If both assertion and reason are true but reason is not a correct explanation of assertion.

Q.13 **Assertion :** Reducing sugar give brick red ppt with Fehling's solution and show mutarotation
Reason : During mutarotation, one pure anomer is converted into mixture of two anomers.

Q.14 **Assertion :** A solution of sucrose in water is dextro rotatory but on hydrolysis in presence of H^+, it becomes leavo rotatory .
Reason : Inversion of sugar follows first order kinetics.

Q.15 Teflon, Polystyrene and Neoprene are all
(A) Addition polymers (B) Chain growth polymer
(C) Condensation polymer (D) Step growth polymer

Q.16 Which of the following pairs can be distinguished by Fehling's solution?
(A) Glucose and fructose (B) Glucose and sucrose
(C) Methanal and ethanal (D) Hydroxy propanone and benzaldehyde

Q.17 Which of the following is monosachharide
(A) Galactose (B) Sucrose (C) Glycogen (D) Cellulose

Q.18 In an amino acid, the carboxylic group ionises at $pka_1 = 2.34$ and the ammonium ion at $pka_2 = 9.60$. The isoelectric point of the amino acid is:
(A) 5.97 (B) 2.34 (C) 9.60 (D) 6.97

Q.19 Lysine is which type of amino acid:
(A) β-Amino acid (B) Acidic (C) Basic (D) Neutral

Q.20 On hydrolysis, which of the following carbohydrate give glucose only.
(A) Sucrose (B) Lactose (C) Maltose (D) Raffinose

Q.21 An organic compound contains C, H, N, S and Cl. For the detection of chlorine, the sodium extract of the compound is first heated with a few drops of concentrated HNO_3 and then $AgNO_3$ is added to get a white ppt of AgCl. The digestion with HNO_3 before the addition of $AgNO_3$ is

(A) to prevent the formation of NO_2. (B) to create a common ion effect.

(C) to convert CN^- and S^{2-} to volatite HCN and H_2S, or else they will interfere with the test forming AgCN or Ag_2S

(D) to prevent the hydrolysis to NaCN and Na_2S.

Q.22 Consider the following statements regarding the methyl glucosides obtained by the reaction of D-glucose with methanol in the presence of dry HCl gas

(i) These are methyl ester of hemiacetal of glucose formed by intramolecular reaction

(ii) There are enantiomers

(iii) These are inomers

(iv) In one of these, all the substituents are equiatorial

Which of the above statements are corrects

(A) i and iii (B) ii and iv (C) ii, iii and iv (D) i, iii and iv

Q.23 a-Amino acids can be identified by:

(A) Baeyer reagent (B) Ninhydrin (C) Tollens reagent (D) $NaSO_3H$

Q.24 Match List-I with List-II and select the correct answer using the codes given below the lists:

	List-I		**List-II**
(a)	α-D and b-D glucose	(i)	Enantiomers
(b)	D-glucose and D-galactose	(ii)	Anomers
(c)	Erythose and threose	(iii)	Epimers
(d)	D-glyceraldehyde and L-glyceraldehyde	(iv)	Diastereomers

Codes:	**(a)**	**(b)**	**(c)**	**(d)**		**(a)**	**(b)**	**(c)**	**(d)**
(A)	iii	ii	i	iv	(B)	ii	iii	iv	i
(C)	iii	ii	iv	i	(D)	ii	iii	i	iv

Q.25 Which amino acid is achiral?

(A) Alamine (B) Valine (C) Proline (D) Glycine

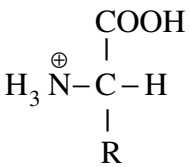
Q.26 If specific rotation of glucose solution is 52° and fructose solution is –92° then what will be specific rotation of invert sugar?

(A) –20° (B) +20° (C) –72° (D) + 72°

Q.27 Which of the following compounds reduces Tollen's reagent?

(A) Glucose (B) Sucrose (C) Methanal (D) formic acid

Q.28 The given structure of α-amino acid will exist at which pH?



(A) 7 (B) 14 (C) 2.1 (D) 12

Q.29 In the given polypeptide:

Arg—Try—Ile—Asn—Gly

C-terminus amino acid is:

(A) Gly (B) Arg (C) Try (D) Asn

Q.30 Which one of the following on reduction with $NaBH_4$ gives equimolar mixture of sorbitol and mannitol?

(A) Glucose (B) Xylose (C) Fructose (D) Mannose

SELF ASSESSMENT SPEED TEST-2

Time : 50 Min ***Max. Marks: 90***

INSTRUCTIONS

Q.1 to Q.30 *have one or more than one correct alternative(s) and carry* ***3 marks*** *each.*
There is ***NEGATIVE*** *marking and* ***1 mark*** *will be deducted for each wrong answer.*

Q.1 A compound with molecular formula $C_6H_{14}O_4$ does not give litmus test and does not give colour with 2,4–DNP. It reacts with excess MeCOCl to give a compound whose vapour density is 117. Compound A contains how many hydroxy groups?
(A) 1 (B) 2 (C) 3 (D) 4

Q.2 When isopentane is subjected to monochlorination. What will be the number of monochlorinated product contain chiral carbon?
(A) 2 (B) 3 (C) 4 (D) 5

Q.3 The heat of hydrogenation of 1-hexene is 126 kJ mol. When a second double bond is introduced in the molecule, the heat of hydrogenation of the resulting compound is found to be 230 $kJmol^{-1}$. The resulting compound (diene) is
(A) 1 : 5 hexadiane (B) 1 : 4 hexadiene
(C) 1 : 3 hexadiene (D) cannot predict from the given information

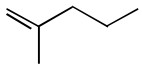
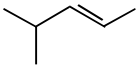
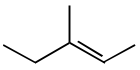
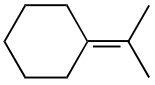
Q.4 $CH_3CH_2CH_3 \xrightarrow[h\nu]{Cl_2} A \xrightarrow[h\nu]{Br_2} B$

A and B are:

(A) $CH_3CH_2CH_2Cl$ and $CH_3\underset{\displaystyle Br}{\underset{|}{C}}H-CH_2-Cl$ (B) $CH_3\underset{\displaystyle Cl}{\underset{|}{C}}HCH_3$ and $CH_3\underset{\displaystyle Br}{\underset{|}{C}}HCH_2Cl$

(C) $CH_3\underset{\displaystyle Cl}{\underset{|}{C}}HCH_3$ and $CH_3\underset{\displaystyle Cl}{\underset{|}{C}}H-CH_2-Br$ (D) $CH_3\underset{\displaystyle Cl}{\underset{|}{C}}HCH_3$ and $CH_3-\underset{\displaystyle Br}{\underset{|}{\overset{\displaystyle Cl}{\overset{|}{C}}}}-CH_3$

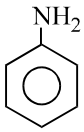
Q.5 Which one of the following compounds gives acetone $(CH_3)_2C=O$ as one of the products of its ozonolysis?

(A)  (B)  (C)  (D) 

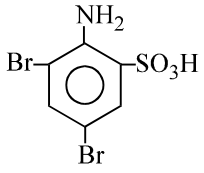
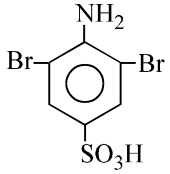
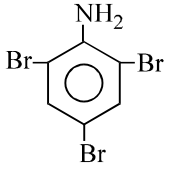
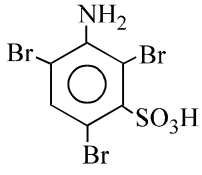
Q.6  $\xrightarrow[CCl_4]{Br_2}$ Products

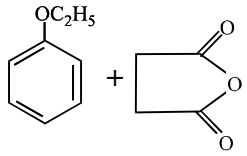
Products obtained in the above reaction is
(A) Diastereomers (B) Enantiomer (C) Meso compound (D) Single pure enantiomer

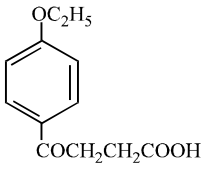
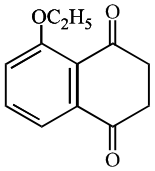
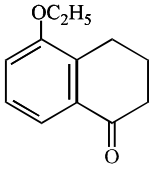
Q.7 Monomer used to prepare Orlon is:
(A) $CH_2=CHCN$ (B) $CH_2=CH-Cl$ (C) $CH_2=CHF$ (D) $CH_2=CCl_2$

Q.8  $\xrightarrow{conc.H_2SO_4}$ (X) $\xrightarrow[excess]{Br_2/H_2O}$ (Y)

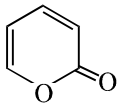
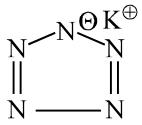
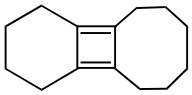
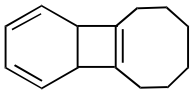
Product (Y) of above reaction is

(A)  (B)  (C)  (D) 

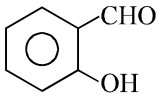
Q.9  $\xrightarrow[H^+/H_2O]{AlCl_3}$ [X] $\xrightarrow{Zn/Hg/HCl}$ [Y] $\xrightarrow{HF}$ [Z]. The structure of [Z] is

(A)  (B)  (C)  (D) none

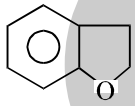
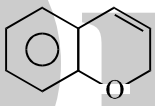
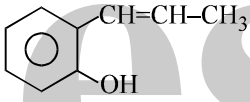
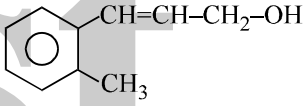
Q.10 Select aromatic compounds:

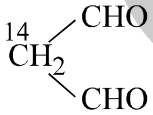
(I)  (II)  (III)  (IV) 

(A) I , II and IV (B) I and II (C) II and IV (D) I, II, III and IV

Q.11  $\xrightarrow{HO^{\ominus}}$ (X) $\xrightarrow{CH_2=CH-\overset{\oplus}{P}Ph_3Br^{\ominus}}$ (Y)

Product (Y) of above reaction is:

(A)  (B)  (C)  (D) 

Q.12  $\xrightarrow[HCl]{Zn\,Hg}$ A

Final major product of this reaction is

(A) $CH_3\overset{14}{C}H_2CH_3$ (B) $\overset{14}{C}H_3CH_2CH_3$ (C) $CH_3\overset{14}{C}H_2-CHO$ (D) $\overset{14}{C}H_3-CH_2-CHO$

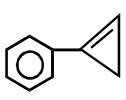
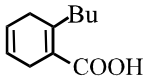
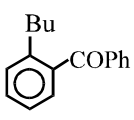
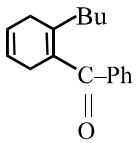
Q.13 Compound A (molecular formula C_3H_8O) is treated with acidified potassium dichromate to form a product B (molecular formula C_3H_6O). B forms a shining silver mirror on warming with ammoniacal silver nitrate, B when treated with an aqueous solution of $NH_2NHCONH_2$ and sodium acetae gives a product C. Identify the structure of C.

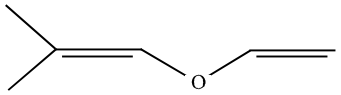
(A) $CH_3CH_2CH = NNHCONH_2$ (B) $CH_3\underset{\displaystyle CH_3}{\underset{|}{C}} = NHHCONH_2$

(C) $CH_3\underset{\displaystyle CH_3}{\underset{|}{C}} = NCONHNH_2$ (D) $CH_3CH_2CH = NCONHNH_2$

Q.14 $Bu-C\equiv CH \xrightarrow{LiNH_2} A \xrightarrow[(ii)\,H_2O]{(i)\,PhCHO} B \xrightarrow{MnO_2} C \xrightarrow[\Delta]{}$ D

Compound D of the above reaction is

(A)  (B)  (C)  (D) 

Q.15  (A) + (B) formed can be distinguished by

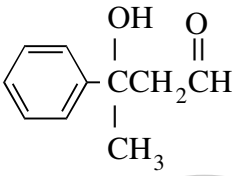
(A) Iodoform (B) Fehling (C) $NaHSO_3$ (D) 2,4-DNP

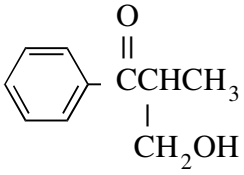
Q.16 $Et-\underset{\underset{O}{\|}}{C}-Me$ is prepared as one of the products by dry distillation of calcium salt of which of the following acids:

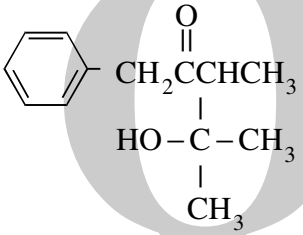
(A) ethanoic acid and methanoic acid (B) Propanoic acid and methanoic acid

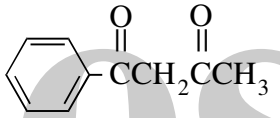
(C) Propanoic acid and ethanoic acid (D) None of these

Q.17 Which one of the following compounds is the best candidate for being prepared by an efficient mixed aldol addition reaction?

(A) 

(B) 

(C) 

(D) 

Q.18 MeCH (CN) CO Me $\xrightarrow[\Delta]{aq.H_2SO_4}$ P

(A) P giving +ve iodoform test & –ve test with Fehling solution.

(B) P giving –ve iodoform test & +ve test with $NaHCO_3$ solution.

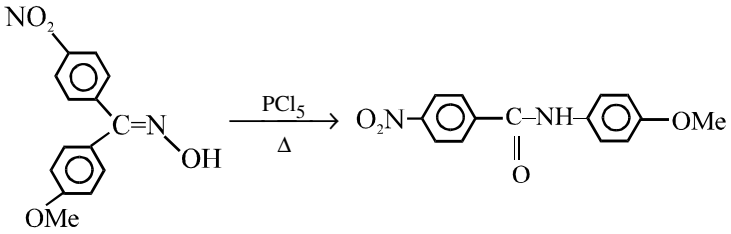
(C) P gives +ve Lucas test & –ve test with $NaHSO_3$ solution

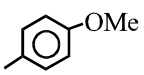
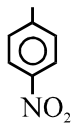
(D) P gives +ve test with $NaHSO_3$ & cerric ammonium nitrate solution.

Q.19 Correct order of reactivity of following acid derivatives is

MeCOCl (I) $MeCON_3$ (II) MeCOOCOMe (III)

(A) I > II > III (B) II > I > III (C) I > III > II (D) II > III > I

Q.20 **(S) :** 

(E): Migratory aptitude of  group is greater than migratory aptitude of  group during cation rearrangements.

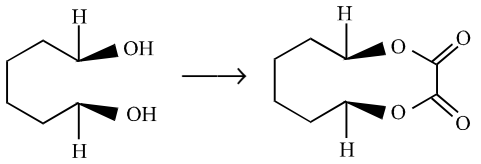
In question below a statement S and an explanation E is given. Choose the correct answers from the codes A, B, C, D given for each question.

(A) S is correct but E is wrong. (B) S is wrong but E is correct.

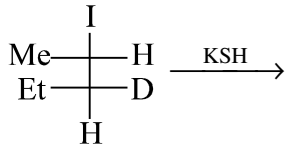
(C) Both S and E are correct and E is correct explanation of S.

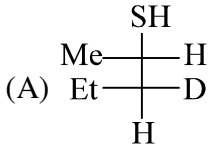
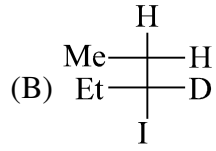
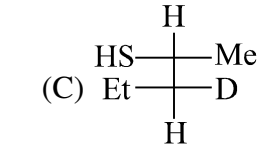
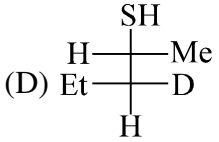
(D) Both S and E are correct but E is not correct explanation of S.

Q.21 Find the reagent used to bring about following conversions.



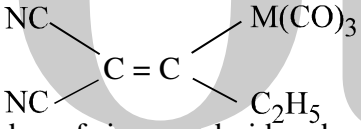
(A) $ClCOCH_2 - CH_2\ COCl$ (B) $CH_3COOCOCH_3$
(C) $CH_3\ COCl$ (D) $ClCO\ COCl$

Q.22 

(A)  (B)  (C)  (D) 

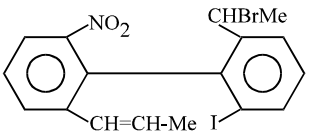
Q.23 The reaction of 4-bromobenzylchloride with sodium cyanide in ethanol leads to
(A) 4-bromobenzylcyanide (B) 4-cyanobenzlychloride
(C) 4-cyanobenzyl cyanide (D) 4-bromo-2-cyanobenzyl chloride

Q.24 In a compound



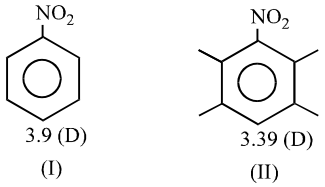
the number of sigma and pi bonds respectively are
(A) 19, 11 (B) 19, 5 (C) 13, 11 (D) 7, 3

Q.25 How many stereoisomers are possible for the adjacent compound?



(A) 2 (B) 4 (C) 6 (D) 8

Q.26 The μ values of the following are given below



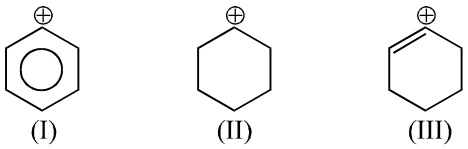
This is because of

(A) Steric inhibition of resonance
(B) Me shows hyperconjugation effect whereas $-NO_2$ shows – R effect in structure II which oppose with each other
(C) + I effects of four Me groups nullify – I effect of NO_2 group.
(D) % of acinitro form of IInd structure is less w.r.t. % of acinitro form of Ist structure

Q.27 Alanine (2-amino propanoic acid) exists as ..... at pH 10

(A) $CH_3-\underset{\underset{NH_2}{|}}{CH}-COO^-$ (B) $CH_3-\underset{\underset{\oplus NH_2}{|}}{CH}-COOH$

(C) $CH_3-\underset{\underset{NH_2}{|}}{CH}-COOH$ (D) $CH_3-\underset{\underset{\oplus NH_3}{|}}{CH}-COO^-$

Q.28 

(I) (II) (III)

Correct order of stability of these carbocations is:

(A) I > II > III (B) I > III > II (C) II > I > III (D) II > III > I

Q.29

	Column I (reactants)		**Column II (product)**
(A)	$PhCH_3 \xrightarrow[H_2O/OH^-]{Cl_2/\Delta}$	(P)	CH_3CHO
(B)	$CH_3-CH=CH_2 + CO + H_2 \xrightarrow{CO(CO_4)_2}$	(Q)	PhCHO
(C)	$CH\equiv CH + H_2O \xrightarrow{Hg^{2+}}$	(R)	$CH_3CH_2CH_2CHO$
(D)	$H_2C=CH_2 + O_2 \xrightarrow[H_2O]{PdCl_2,CuCl_2}$		

Q.30

	Column I (organic compounds oxidised by HIO_4)		**Column II (products of HIO_4 oxidation)**
(A)	$CH_3CH_2\underset{\displaystyle OH}{\underset{\vert}{CH}}-\underset{\displaystyle OH}{\underset{\vert}{CH}}-CH_2CH_3 \xrightarrow{HIO_4}$	(P)	$2H_2C=O + HCOOH$
(B)	$PhCH_2\underset{\displaystyle OH}{\underset{\vert}{CH}}-\underset{\displaystyle OH}{\underset{\vert}{CH}}-CH_3 \xrightarrow{HIO_4}$	(Q)	$2CH_3CH_2CH=O$
(C)	$\underset{\displaystyle OH}{\underset{\vert}{CH_2}}-\underset{\displaystyle OH}{\underset{\vert}{CH_2}} \xrightarrow{HIO_4}$	(R)	$2H_2C=O$
(D)	$\underset{\displaystyle OH}{\underset{\vert}{CH_2}}-\underset{\displaystyle OH}{\underset{\vert}{CH_2}}-\underset{\displaystyle OH}{\underset{\vert}{CH_2}} \xrightarrow{HIO_4}$	(S)	$PhCH_2CH=O + CH_3CH=O$

SELF ASSESSMENT SPEED TEST-3

Time : 50 Min ***Max. Marks: 90***

INSTRUCTIONS

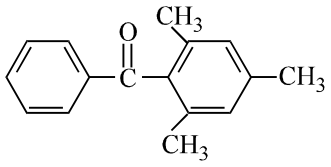
Q.1 to Q.30 *have one or more than one correct alternative(s) and carry* ***3 marks*** *each.*
There is ***NEGATIVE*** *marking and* ***1 mark*** *will be deducted for each wrong answer.*

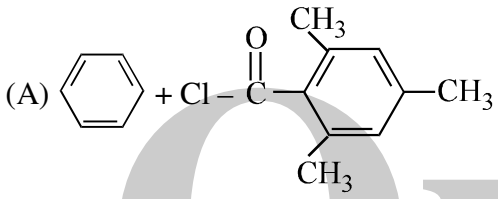
Q.1 Pick an ether which can be prepared by direct Williamson's synthesis.

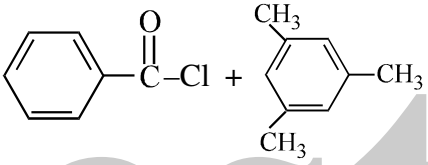
(A) $CH_3CH_2CH_2–O–CH_2CH_2CH_3$ (B) $Ph–O–CH_2CH_3$

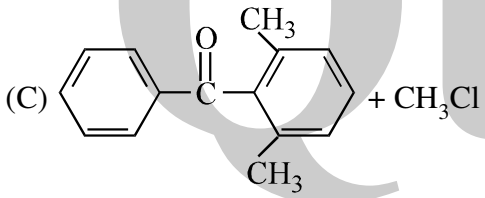
(C) $(CH_3)_3C–O–C_2H_5$ (D) $CH_3CH=CH–O–CH=CH_2$

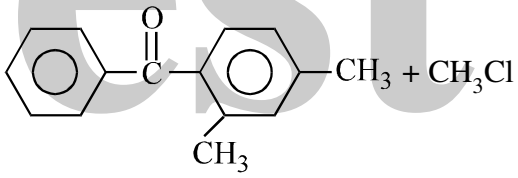
Q.2 The given product can not be formed by which set of reactants in the presence of $AlCl_3$ catalyst.



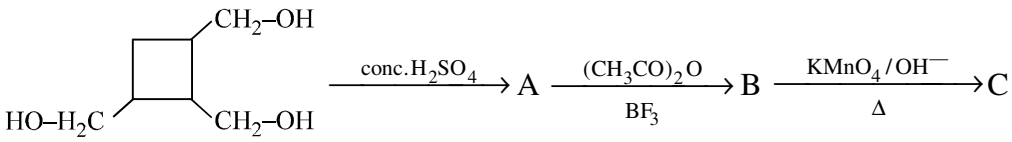
(A) 

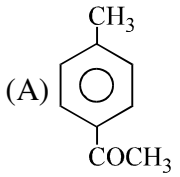
(B) 

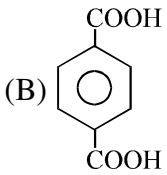
(C) 

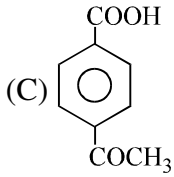
(D) 

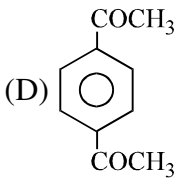
Q.3 The final major product of the following reaction is



(A) 

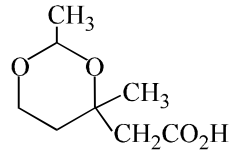
(B) 

(C) 

(D) 

Question No. 4 to 6 (3 questions)

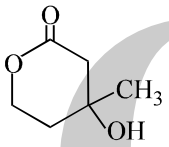
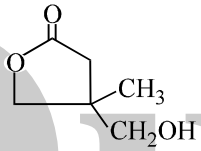
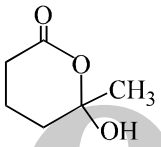
A research scholar synthesised the compound A in the laboratory

A: 

He wanted to study this compound in acidic medium and kept for some time in it. After an hour, when isolated the compound, to his surprise, he got the mixture of two compounds B, C. He studied their properties and compared them with A.

	A	B	C
reaction with $HaHCO_3$	*brisk effervescence*	*no*	*no*
blue litmus	*red*	*no*	*no*
NaOI	*no*	*no*	*yellow ppt.*
$[Ag(NH_3)_2]^+$	*no*	*no*	*silver - mirror*
clue	*original*	$A \xrightarrow{H_3O^+} B + C$	*carbon* = 54.55%, *hydrogen* = 9.1%

Q.4 B formed is

(A)  (B)  (C)  (D) none

Q.5 Compound C is

(A) $CH_3\overset{\overset{O}{\|}}{C}CH_3$ (B) CH_3CH_2CHO (C) HCHO (D) CH_3CHO

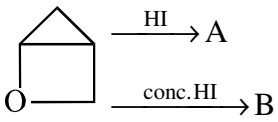
Q.6 B is formed due to

(A) cleavage of C–O bond followed by esterification between –COOH and –OH present.

(B) decarboxylation of –COOH group

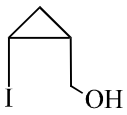
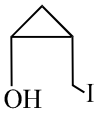
(C) oxidation of $-CH_2COOH$ into –COOH

(D) none

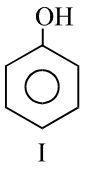
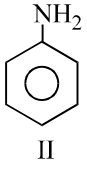
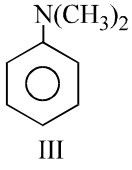
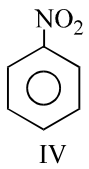
Q.7 

A & B are respectively:

(A)  (B) 

(C) Both  (D) Both 

Q.8 An aromatic electrophilic substitution reaction with $NaNO_2$ / HCl will be observed in

(A)  I (B)  II (C)  III (D)  IV

Q.9 Which of the following will give a product with phenolic group on heating

(A) Phenyl propyl ether (B) Phenyl allyl ether

(C) Phenyl crotyl ether (D) Phenyl venyl ether

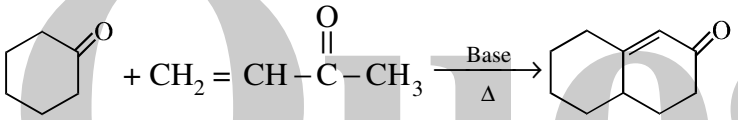
Q.10 Questions given below consist of two statements each printed as Assertion (A) and Reason (R); while answering these questions you are required to choose any one of the following four responses:
(A) if both (A) and (R) are true and (R) is the correct explanation of (A)
(B) if both (A) and (R) are true but (R) is not correct explanation of (A)
(C) if (A) is true but (R) is false
(D) if (A) is false and (R) is true

Assertion : Two products, alkyl cyanide and alkyl isocyanide are obtained during the reaction of alkyl halides with KCN. Order of cyanide isocyanide ratio is : 1°>2°>3°.

Reason : 3° alkyl halide undergo S_N1 reaction which is non selective with respect to nucleophile strength.

Q.11 Select true statement(s)
(A) Every alcohol which gives red colour during Victor Meyor test will give turbidity only on heating with Lucas reagent.
(B) Propanol and isopropanol can be differentiated by idoform test.
(C) Butanol and isobutanol can be differentiated by Lucas test.
(D) Both iso-pentyl alcohol and neopentyl alcohol give product with same functional group with $H^{\oplus}KMnO_4$

Q.12 In the reaction,

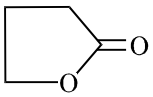


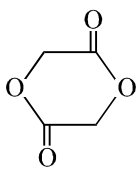
how is the product formed?
(A) Micheal addition followed by aldol condensation
(B) Aldol condensation followed by Micheal addition
(C) Mannich reaction
(D) Knoevenagel reaction followed by aldol condensation

Q.13 Which are correct statements:
(A) Cannizzaro reaction is hydride transfer reaction
(B) Hofmann-degradation of acid amide involves intramolecular migration of alkyl / aryl group from C toN
(C) Fries migration is intramolecular
(D) Cannizzaro reaction is disproportionation reaction

Q.14 Which is / are true statements:

(A) $\underset{\underset{NH_2}{|}}{CH_2-CH_2-COOH}$ on heating is converted into $CH_2 = CHCOOH$

(B) $\underset{\underset{OH}{|}}{CH_2-CH_2-CH_2COOH}$ on heating is converted into 

(C) $\underset{\underset{OH}{|}}{CH_2COOH}$ on heating forms 

(D) $\underset{\underset{NH_2}{|}}{CH_2COOH}$ forms Zwitter ion which moves towards cathode at pH = 4.

Q.15 $PhMgBr + 2PhCHO \xrightarrow[\Delta]{} A \xrightarrow{H_2O} B$

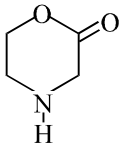
B is

(A) $Ph_2CH–OH$ (B) $Ph_3C–OH$ (C) $PhCH_2–OH$ (D) Ph–OH

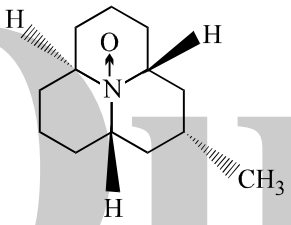
Q.16 $Me-\overset{\overset{O}{\|}}{C}-O-CH_2-CH_2-\overset{\oplus}{N}H_3 \xrightarrow{NaOH} Q$

Q is:

(A) $Me-\overset{\overset{O}{\|}}{C}-O-CH_2-CH_2-NH_2$ (B) $Me-\overset{\overset{O}{\|}}{C}-NH-CH_2-CH_2-OH$

(C)  (D) $MeCOONa + HOCH_2CH_2NH_2$

Q.17 How many asymmetric carbon atoms are present in the following compound Coccinellin?



Coccinellin

(A) 2 (B) 3 (C) 4 (D) 6

Q.18 Which one of the following is non-reducing sugar?

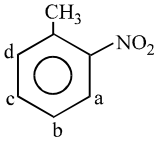
(A) Glucose (B) Arabinose (C) Fructose (D) Sucrose

Q.19 Which of the following molecules is capable of forming Zwitter ion?

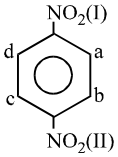
(A) $CH_3–CHOH–NH_2$ (B) $NH_2–CH_2–COOH$

(C) $CH_3–COOH$ (D) $CCl_3–NO_2$

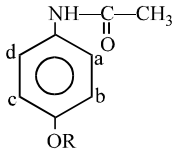
Q.20 Which of the following option is correct? Where a, b, c, d are positions of electrophilic attack. Nf = Not favourable; f = favourable (for electrophilic attack)

(A) 

effect of	a	b	c	d
$–CH_3$grp	Nf	f	Nf	f
$–NO_2$grp	Nf	f	Nf	f

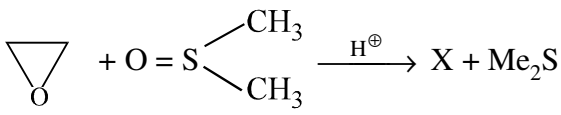
(B) 

effect of	a	b	c	d
$–NO_2$ (I)	Nf	Nf	f	Nf
$–NO_2$ (II)	Nf	Nf	f	Nf

(C) 

effect of	a	b	c	d
$–NH–\overset{\overset{O}{\|}}{C}–CH_3$	f	f	Nf	Nf
–OR	Nf	Nf	f	f

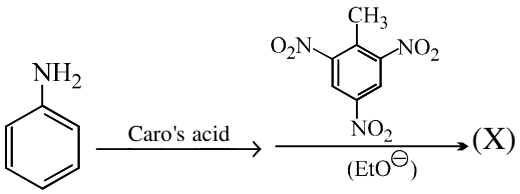
(D) All

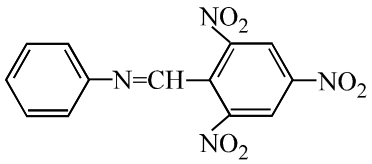
Q.21 

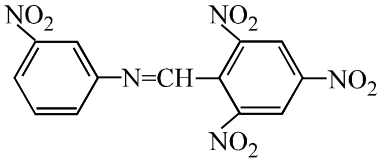
Structure of X is

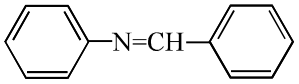
(A) $HO–CH_2–CHO$ (B) $\overset{OH}{\underset{CH_2}{|}}-\overset{OH}{\underset{CH_2}{|}}$ (C) $\overset{CHO}{\underset{CHO}{|}}$ (D) $\overset{CH_2-CH_3}{\underset{OH}{|}}$

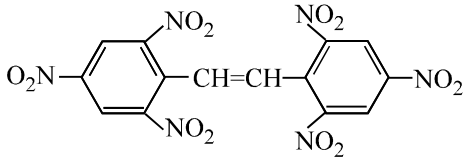
Q.22 Identify (X) of the following reaction:

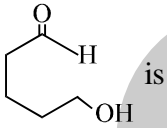


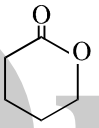
(A) 

(B) 

(C) 

(D) 

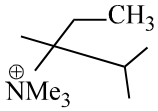
Q.23 

is converted into 

by

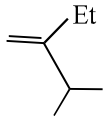
(A) (i) $KMnO_4$(ii) H^+; Δ (B) (i) $Na_2Cr_2O_7$, H^+ (ii) H^+ ; Δ

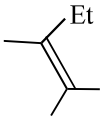
(C) (i) $Ag(NH_3)_2^+$ (ii) H^+ ; Δ (D) All of these

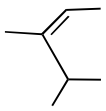
Q.24 

$\xrightarrow[\Delta]{OH}$ Olefinic product.

Identify major product

(A) 

(B) 

(C) 

(D) None of these

Q.25 $Ph_3C-\overset{\overset{O}{\|}}{C}-OH \xrightarrow[MeOH]{conc.H_2SO_4}$ (A)

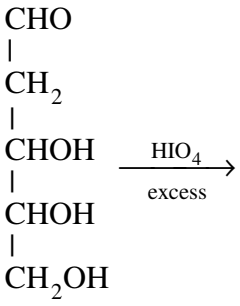
A is:

(A) $Ph_3C-\overset{\overset{O}{\|}}{C}-OMe$ (B) $Ph_3C-\ddot{O}Me$ (C) $Ph_3C-\ddot{O}H$ (D) $Ph-\overset{\overset{O}{\|}}{C}-Ph$

Q.26 An alkene c_nH_{2n} is converted by a reduction procedure to c_nH_{2n+2}. The % change in the molecular weight = 3.57. What is the value of n?

(A) 2 (B) 3 (C) 4 (D) 5

Q.27 The product expected from the reaction



(A) $H-\overset{\overset{O}{\|}}{C}-CH_2-CHO+HCOOH+HCHO$

(B) HOOC–CHOH–CHOH–COOH+HCOOH

(C) $HOOC-CH_2CH_2COOH + HCOOH + HCHO$

(D) HOOC – COOH + HCOOH + HCHO

Q.28

	Column I (reaction)		**Column II (name of the reaction)**
(A)	$2C_6H_5CHO \xrightarrow{20\%\ NaOH}$	(P)	Benzoin condensation
(B)	$C_6H_5CHO + HCHO \xrightarrow{20\%\ NaOH}$	(Q)	Cannizzaro reaction
(C)	$2C_6H_5CHO \xrightarrow{KCN/C_2H_5OH}$	(R)	Cross cannizzaro reaction
(D)	$C_6H_5CHO + (CH_3CO)_2O \xrightarrow[\Delta]{CH_3COONa}$	(S)	Perkin reaction

Q.29

	Column I (reaction)		**Column II (reagent)**
(A)	Wolf-kishner reduction	(P)	$NaCN/C_2H_5OH$
(B)	Witting reaction	(Q)	$(C_6H_5)_3P=CH_2$
(C)	Benzoin condensation	(R)	conc. NaOH
(D)	Cannizzaro reaction	(S)	NH_2NH_2/KOH

Q.30

	Column I (compound)		**Column II (pka)**
(A)	$CH_3-\overset{\overset{O}{\|}}{C}-CH_2-COOC_2H_5$	(P)	17
(B)	$CH_3-\overset{\overset{O}{\|}}{C}-CH_2-\overset{\overset{O}{\|}}{C}-CH_3$	(Q)	8.9
(C)	$CHO-CH_2-CHO$	(R)	10.7
(D)	CH_3-CHO	(S)	5

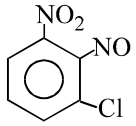
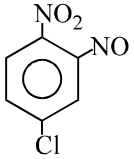
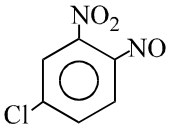
SELF ASSESSMENT SPEED TEST-4

Time : 50 Min ***Max. Marks: 90***

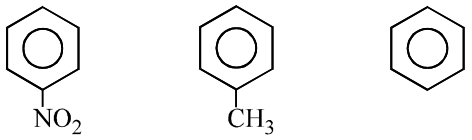
INSTRUCTIONS

Q.1 to Q.30 *have one or more than one correct alternative(s) and carry* ***3 marks*** *each.*
There is ***NEGATIVE*** *marking and* ***1 mark*** *will be deducted for each wrong answer.*

Q.1 The major product obtained when o-nitronitrosobenzene is treated with chlorine in presence of Lewis acid.

(A)  (B)  (C)  (D) reaction will not take place

Q.2 Ease of oxidation in following will be



(I) (II) (III)

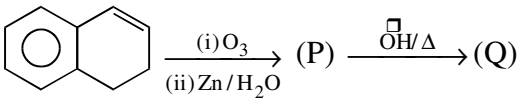
(A) I > II > III (B) III > II > I (C) I > III > II (D) II > III > I

Q.3 Which is not alcohol–
(A) CH_2=CH–CH_2OH (B) $CH_2OH.CH_2OH$
(C) $C_6H_5CH_2OH$ (D) C_6H_5OH

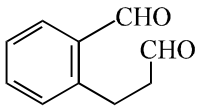
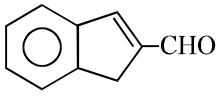
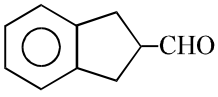
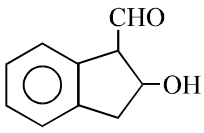
Q.4 The Lucas test is used to determine the type of–
(A) Amines (B) Alcohols (C) Acids (D) Phenols

Q.5 Consider the following statements about β-diketones:
(A) They show keto-enol tautomerism.
(B) The enol form is capable of forming an intramolecular hydrogen bonding
(C) The methylene group flanked by two carbonyl groups can be easily deprotonated
(D) None of these

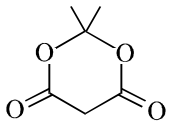
Q.6 In the given reaction sequence



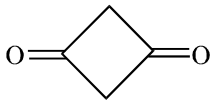
& compound (P) and (Q) are

(A)  (B)  (C)  (D) 

Q.7 Consider the following statements:
(A) 1,3-dicarbonyl compounds such as ethyl acetoacetate are usually mostly enolised.
(B) The given compound (a) exists mainly in enol form (100%)



(a)

(C) The given compound (b) exists only in keto form 

(b)

(D) None of these

Q.8 Decarboxylation will take place on heating

(A) methyl malonic acid (B) succinic acid

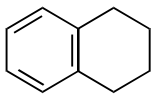
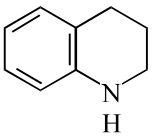
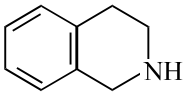
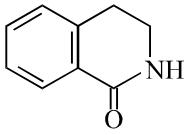
(C) 2,2-dimethyl acetoacetic acid (D) in all cases

Q.9 Alanine forms Zwitter ion which exists as :

(A) $CH_3-\underset{\oplus NH_3}{\underset{|}{CH}}COO^{\ominus}$ in acidic medium (B) $CH_3-\underset{\oplus NH_3}{\underset{|}{CH}}COOH$ in a medium of pH = 4

(C) $CH_3-\underset{NH_3}{\underset{|}{CH}}-COO^{\ominus}$ in a medium of pH = 13 (D) $CH_3-\underset{NH_3}{\underset{|}{CH}}COO^{\ominus}$ in a medium of pH = 2

Q.10 Which one of the following compounds undergoes bromination of its aromatic ring (electrophilic aromatic substitution) at the *fastest* rate?

(A)  (B)  (C)  (D) 

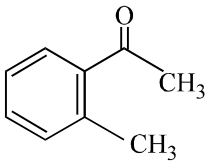
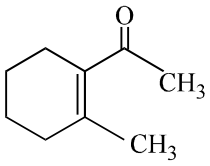
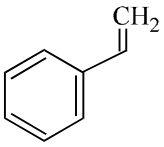
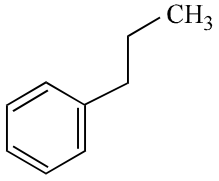
Q.11 $CH_2=CH_2 \xrightarrow{PhCO_3H} A \xrightarrow{H_3O^{\oplus}} B \xrightarrow[(2eq)]{PI_3,\Delta} C$

Structure of C is

(A) $\underset{OH}{\underset{|}{CH_2}}-\underset{I}{\underset{|}{CH_2}}$ (B) $CH_2=CH_2$ (C) CH_2-CH_2 (O bridge) (D) $\underset{I}{\underset{|}{CH_2}}-\underset{I}{\underset{|}{CH_2}}$

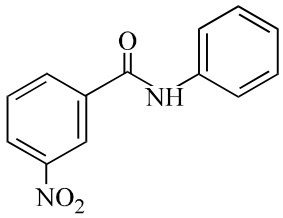
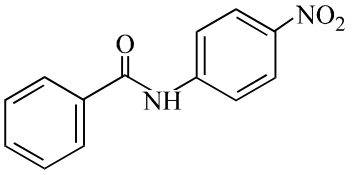
Q.12 (B) $\xrightarrow[conc.HCl]{Zn-Hg} P \xrightarrow{NBS} Q \xrightarrow{alc.KOH} R \xrightarrow[peroxide]{HBr} S \xrightarrow{(CH_3)_2CuLi} T.$

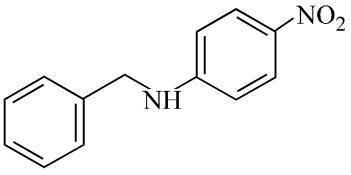
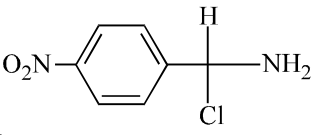
T is :

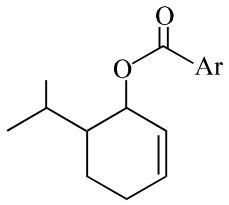
(A)  (B)  (C)  (D) 

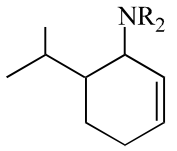
Q.13 B $\xrightarrow{NaOI}$ V $\xrightarrow{SOCl_2}$ W $\xrightarrow[NaOH]{C_6H_5NH_2}$ X $\xrightarrow[conc.H_2SO_4 \text{ (1 equivalent)}]{conc.HNO_3}$ Y.

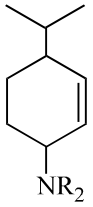
Y is :

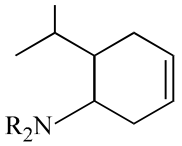
(A)  (B) 

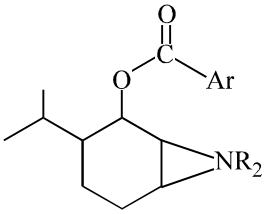
(C)  (D) 

Q.14  $\xrightarrow[DMF]{R_2NH}$ Q (major); Q would be:

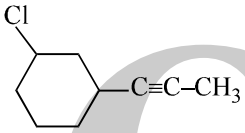
(A) 

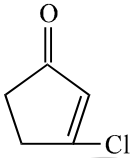
(B) 

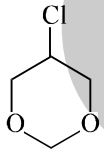
(C) 

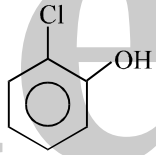
(D) 

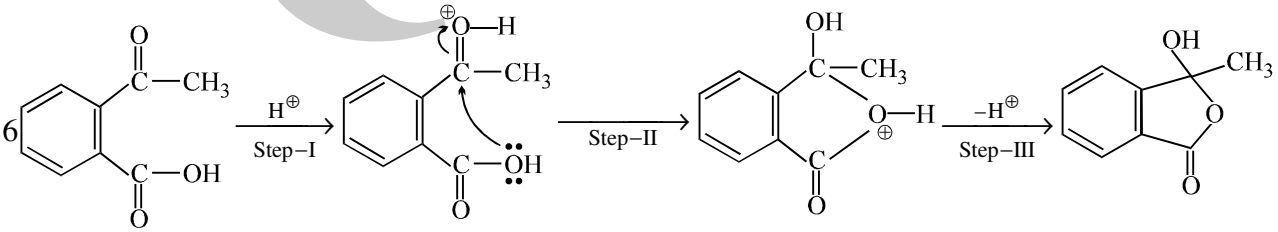
Q.15 Organic halide that posses a functional group that react with R–MgX cannot themselve form a grignard reagent. Indicate which of the following chlorides need to have its other functional group protected in order to generate R–MgCl

(A) 

(B) 

(C) 

(D) 

Q.16 

Which of the following statements are correct?

(A) First step is protonation reaction which is reversible

(B) Second step is RDS

(C) Second step is Nu^r addition reaction

(D) Product of reaction is ester

Q.17 Urea may be identified by which of the following test

(A) with $CHCl_3$ / KOH, it gives very offensive odour

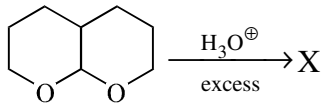
(B) with HNO_2, it evolves H_2 & CO_2

(C) with NaOH and a drop of $CuSO_4$, it gives violet colour

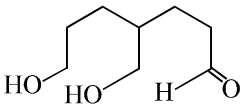
(D) with NaOH on heating, it gives smell of NH_3 gas

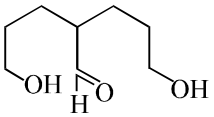
Q.18 On oxidation of alcohol with $H^{\oplus}$ $K_2Cr_2O_7$, maximum yield of carbonyl compound will be obtained in

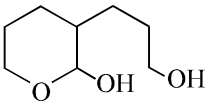
(A) 1° alcohol (B) 2° alcohol (C) 3° alcohol (D) equal in 1° & 2° alcohol

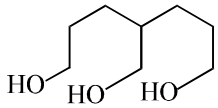
Q.19 

Structure of X is

(A) 

(B) 

(C) 

(D) 

Q.20 How many products are produced respectively when optically pure glucose and fructose are reduced one by one by $NaBH_4$.

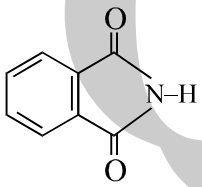
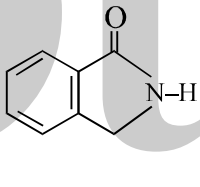
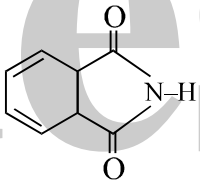
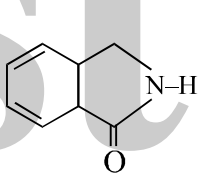
(A) 1 & 1 (B) 2 & 2 (C) 1 & 2 (D) 2 & 1

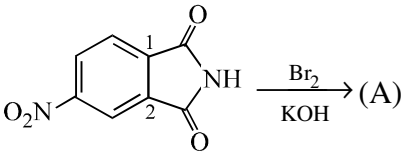
Q.21 Glucose and mannose are:

(A) Anomers (B) Positional isomers

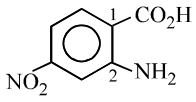
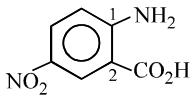
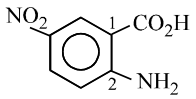
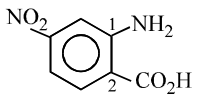
(C) Functional isomers (D) Epimers

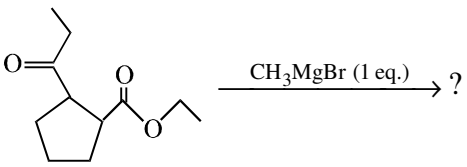
Q.22 Which of the following is most acidic:

(A)  (B)  (C)  (D) 

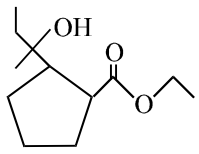
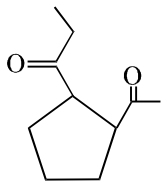
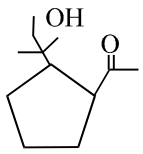
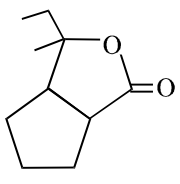
Q.23 

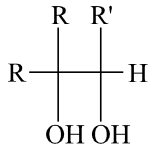
4-nitrophthalimide. Identify (A).

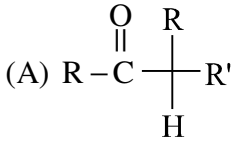
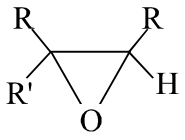
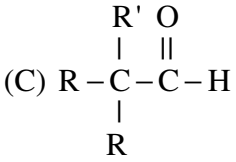
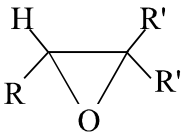
(A)  (B)  (C)  (D) 

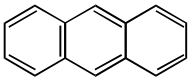
Q.24 

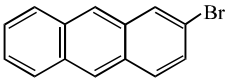
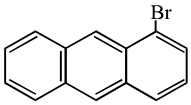
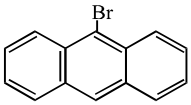
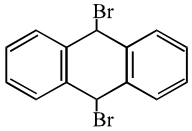
The product is:

(A)  (B)  (C)  (D) 

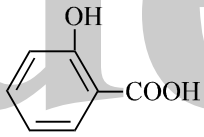
Q.25  $\xrightarrow{TsCl}$ (A) $\xrightarrow{Base}$ (B)

(A)  (B)  (C)  (D) 

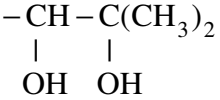
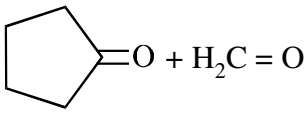
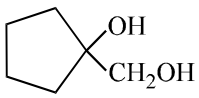
Q.26 When  reacts with Br_2/CCl_4, the major product obtained is

(A)  (B)  (C)  (D) 

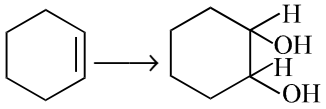
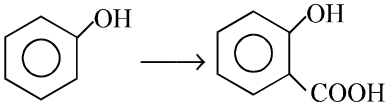
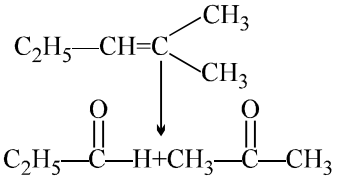
Q.27

Column I (reaction)	**Column II (name of the reactions)**
(A) $C_6H_5CHO + NaOH \rightarrow C_6H_5COOH + C_6H_5CH_2OH$	(P) Rosenmund's reaction
(B) $C_6H_6 + CH_3Cl \xrightarrow[AlCl_3]{Anhyd.} C_6H_5CH_3$	(Q) Kolbe's Schmidt reaction
(C) $RCOCl + H_2 \xrightarrow{Pd/BaSO_4} RCHO$	(R) Friedel-Crafts reaction
(D) $C_6H_5OH + NaOH + CO_2 \xrightarrow[H^+]{Heat}$ 	(S) Cannizzaro's reaction

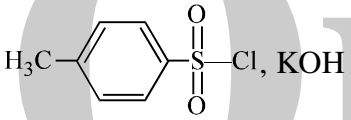
Q.28

Column I (products obtaines on oxidation with HIO_4)	**Column II (compounds that give product by HIO_4 oxidation)**
(A) $PhCH = O + CH_3COCH_3$	(P) Cyclopentane-1,2-diol
(B) $O = CH(CH_2)_3\ CH=O$	(Q) 
(C) 	(R) 
(D) $2H_2C = O + HCOOH$	(S) Glycerol

Q.29

	Column I		**Column II**
(A)		(P)	$CHCl_3$ + aq. NaOH
(B)	$CH_3CH_2CH = CH_2 \longrightarrow CH_3CH_2CH_2CH_3$	(Q)	$O_3 + H_2O$
(C)		(R)	$KMnO_4$
(D)		(S)	H_2/Pd

Q.30 Match **List-I** with **List-II** and select the correct answer using the codes given below the lists.

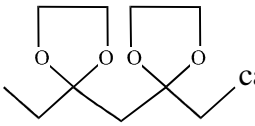
	List-I (Compound)		**List-II (Used for separated between)**
(A)	$NaHCO_3$ solution	(P)	$CH_3CH_2NH_2$ and $(CH_3CH_2)_2NH$
(B)	$NaHSO_3$	(Q)	Water insoluble amides and water insoluble amines.
(C)	dil. HCl	(R)	CH_3CH_2OH and CH_3CHO
(D)		(S)	Water insoluble carboxylic acids from water insoluble phenols.

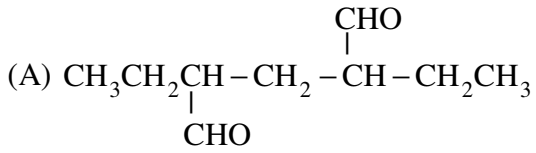
SELF ASSESSMENT SPEED TEST-5

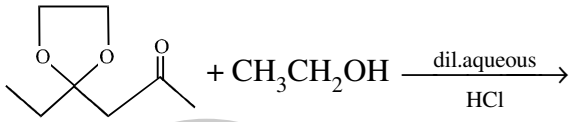
Time : 50 Min ***Max. Marks: 90***

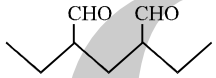
INSTRUCTIONS

Q.1 to Q.30 *have one or more than one correct alternative(s) and carry* ***3 marks*** *each.*
There is ***NEGATIVE*** *marking and* ***1 mark*** *will be deducted for each wrong answer.*

Q.1  can be got from

(A) 

(B) 

(C)  and 2 units of ethylene glycol

(D) $CH_3CH_2COCH_2COCH_2CH_3$ and $HOCH_2CH_2OH$

Q.2 Give the correct order of initials **T** or **F** for following statements. Use **T** if statement is true and **F** if it is false.

Statement : 1 Many S_N2 reactions of alkyl chlorides and alkyl bromides are catalyzed by the addition of sodium or potassium iodide. For example, the hydrolysis of methyl bromide takes place much faster in the presence of sodium iodide.

Statement : 2 1-Bromobicyclo[2.2.1]heptane is extremely unreactive in either S_N2 or S_N1 reactions.

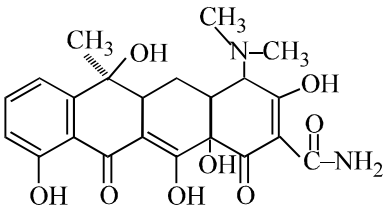
Statement : 3 When ethyl bromide reacts with silver cyanide in methanol, the major product is CH_3CH_2CN. Some CH_3CH_2NC is formed as well.

(A) FTF (B) TTF (C) TFF (D) TFT

Q.3 Following alkyl bromides were subjected to hydrolises in a mixture of ethanol and water (80% C_2H_5OH/20% H_2O) at 55°C, $(CH_3)_3CBr$, $(CH_3)_2CHBr$, CH_3CH_2Br, CH_3Br correct order of rate of reaction will be

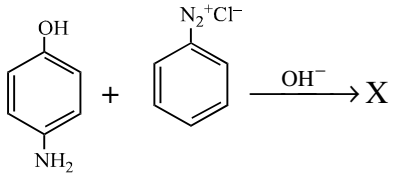
(A) $(CH_3)_3CBr > (CH_3)_2CHBr > CH_3CH_2Br > CH_3B$
(B) $(CH_3)_3CBr > CH_3Br > CH_3CH_2Br > (CH_3)_2CHBr$
(C) $(CH_3)_3CBr < (CH_3)_2CHBr < CH_3CH_2Br < CH_3B$
(D) $(CH_3)_3CBr > (CH_3)_2CHBr > CH_3Br > CH_3CH_2Br$

Q.4 Tetracyline is called a broad spectrum antibiotic because it active against a wide variety of bacteria. How many chirality center does tetracyline have?

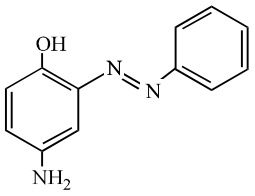
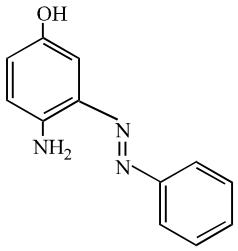
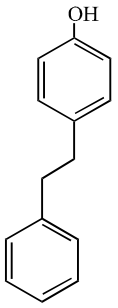


(A) 3 (B) 4 (C) 5 (D) 6

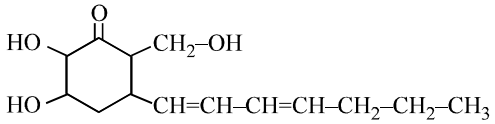
Q.5 Consider the reaction



here X is

(A)  (B)  (C)  (D) None

Q.6 A Natural occuring element has the constitutional shown.



How many stereoisomer may have this constitution?

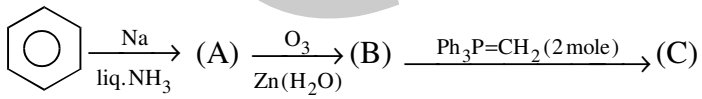
(A) 8 (B) 16

(C) 64 (D) 128

Q.7 IUPAC name of $CH_3-CH_2-\underset{\underset{H}{|}}{N}-CHO$ is

(A) N-ethyl aminoethanol (B) N-formyl aminoethane

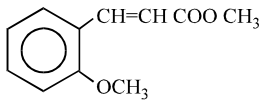
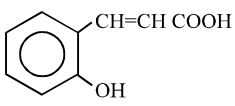
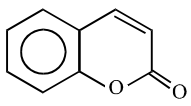
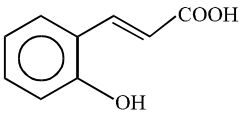
(C) N-ethyl methanamide (D) ethanaminal

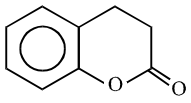
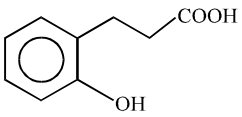
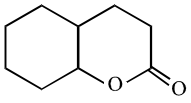
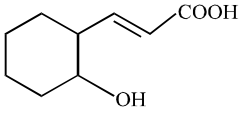
Q.8 

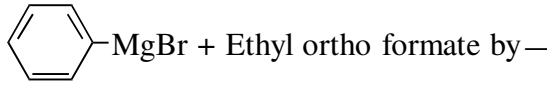
Product (C) in above reaction is

(A) 1,4-hexadiene (B) 1,4-Pentadiene (C) 1,3-butadiene (D) 1,4-heptadiene

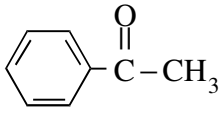
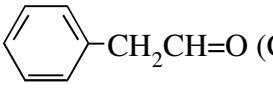
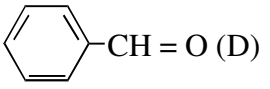
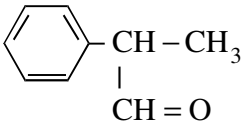
Q.9 A compound [X] discharges bromine water in CCl_4. The compound neither gives a any colour with $FeCl_3$ nor effervescences with aq. $NaHCO_3$ solution. However, its hydrolysate with conc. KOH followed by acidification gives another compound Y which gives colour with $FeCl_3$ solution as well as effervescences of CO_2 with $NaHCO_3$ solution. Compounds X and Y respectively are

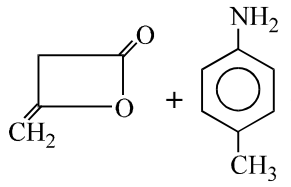
(A)  and  (B)  and 

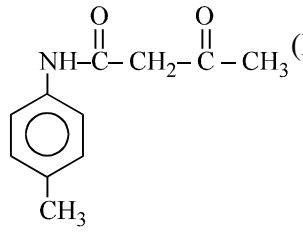
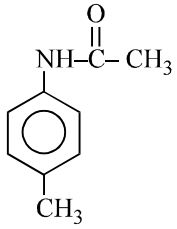
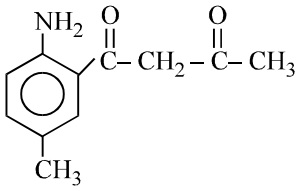
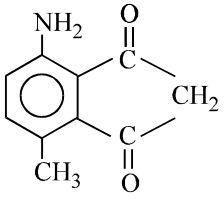
(C)  and  (D)  and 

Q.10 

solution.

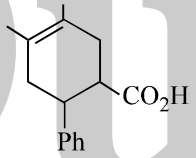
(A)  (B)  (C)  (D) 

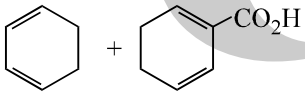
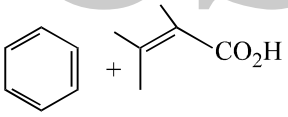
Q.11  P (Product). P is:

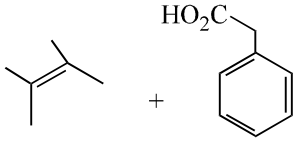
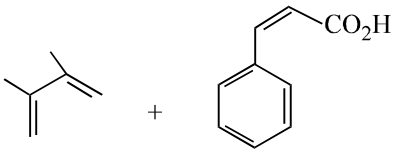
(A)  (B)  (C)  (D) 

Q.12 There are four alcohols P, Q, R, S which have 3, 2, 1, zero alpha hydrogen atoms, which will not give any color in Victor Meyer test:
(A) P (B) Q (C) R (D) S

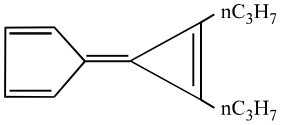
Q.13 What combination of diene and dienophile would you choose in order to prepare the following compound?



(A)  (B) 

(C)  (D) 

Q.14 Ordinarily the barrier to rotation about a carbon-carbon double bond is quite high but compound A was observed by NMR to have a rotational barrier of only about 20 K cal / mole

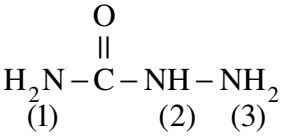
 The reason for this is

(A)

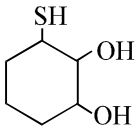
(A) double bond having partial triple bond character because of resonance
(B) double bond undergo flipping
(C) double bond having very high single bond character because of aromaticity gained in both 3 & 5 membered ring.
(D) + I effect of nC_3H_7 groups makes double bond having partial single bond character.

Q.15 Catalyst used in conversion of n-hexane into benzene is:
(A) $AlCl_3$ (B) SiO_2–Al_2O_3 (C) Cr_2O_3–Al_2O_3 (D) MnO_2

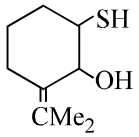
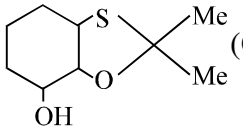
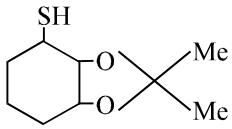
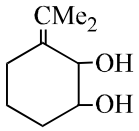
Q.16 Which of the amino group in semi carbazide will react with carbonyl group:



(A) 1 (B) 2 (C) 3 (D) 1 & 3

Q.17  + $Me_2C = O \xrightarrow{dry\ HCl}$ A

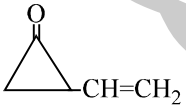
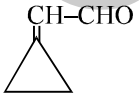
A is:

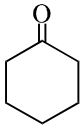
(A)  (B)  (C)  (D) 

Q.18  + $CH_3CHO \xrightarrow[\Delta]{KOH}$ P

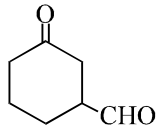
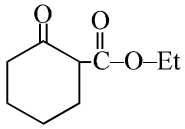
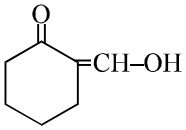
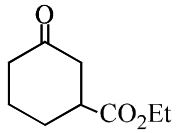
P is:

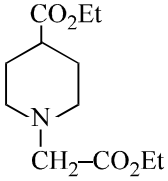
(A) CH_3CH_2–$COCH_2CHO$ (B) 

(C)  (D) 

Q.19  + $HCO_2Et \xrightarrow{EtONa}$ (X)

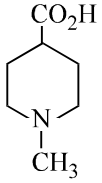
Identify unknown (X) in above reaction

(A)  (B)  (C)  (D) 

Q.20 

$\xrightarrow{EtO^{\ominus}}$ $\xrightarrow[\Delta]{H_3O^{\oplus}}$ $\xrightarrow[HCl]{Zn(Hg)}$ (X)

Product (X) of above reaction is:

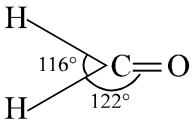
(A)  (B)  (C)  (D) 

Q.21 Guess the product

$CH_3CH_2CONH_2 \xrightarrow[\Delta]{PCl_5} ?$

(A) CH_3CH_2–CN (B) CH_3CH_2COCl (C) $CH_3CCl_2CONH_2$ (D) $CH_3CH_2CONHCl$

Q.22 These questions consist of two statements each, printed as assertion and reason, while answering these questions you are required to choose any one of the following responses.
(A) If assertion is true but the reason is false.
(B) If assertion is false but the reason is true.
(C) If both assertion and reason are true and the reason is a correct explanation of assertion.
(D) If both assertion and reason are true but reason is not a correct explanation of assertion.

(A) HCHO has sp^2-hybridised carbon and the following geometry: 

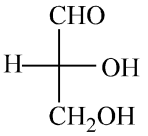
(R) The bond angles are changed due to greater multiple bond-single bond repulsion, then single bond- single bond repulsion.

Q.23 Which of the following order are correct ?
(I) Acidity order : o-nitrobenzoic acid > p-nitrobenzoic acid > m-nitrobenzoic acid
(II) Basicity order : $NH_2^- > EtO^- > OH^- > RCOO^- > Cl^-$
(III) Heat of hydrogenation:
cis-2-butene > trans-2-butene
(IV) Ease of decarboxylation :

$$Ph-\underset{\underset{O}{\|}}{C}-CH_2-COOH \quad C_6H_5COCOOH \quad Ph-\underset{\underset{OH}{|}}{CH}-COOH \quad Ph-\underset{\underset{NH_2}{|}}{CH}-COOH$$

(A) I & II (B) I & III (C) I & IV (D) I , II & III

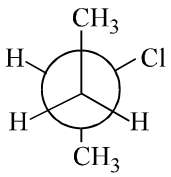
Q.24 Nylon-6 is prepared by linear condensation homopolymerization reaction of:
(A) caprolactum (B) hexamethylene diamine and adipic acid
(C) 6-aminohexanoic acid (D) acrylonitrile

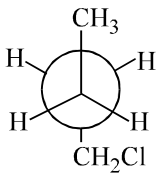
Q.25 

$+ HCN \longrightarrow A + B$

A & B are
(A) Meso compounds (B) diastereoisomers (C) enantiomers (D) both A & B

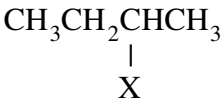
Q.26 The following pair of compounds represents:





(A) same compound (B) diastereomers (C) enantiomers (D) structural isomers

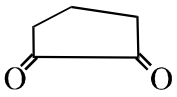
Q.27 Correct order of yield of Hofmann alkene in following reaction will be

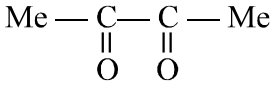


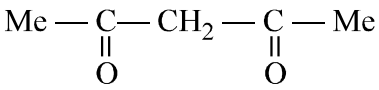
X may be F, Cl, Br or I

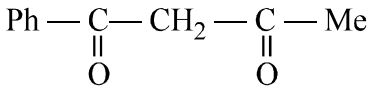
(A) F > Cl > Br > I
(B) I > Be > Cl > F
(C) Cl > F > Br > I
(D) I > Br > F > Cl

Q.28 Order of enolic content

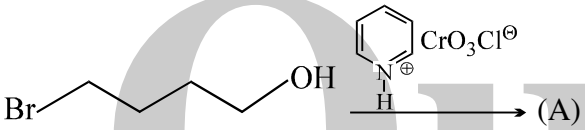
(I) 

(II) 

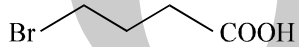
(III) 

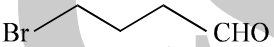
(IV) 

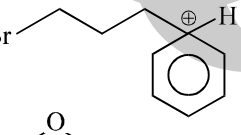
(A) II > III > IV > I (B) I > III > IV > II (C) I > IV > III > II (D) IV > III > I > II

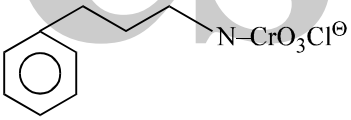
Q.29 

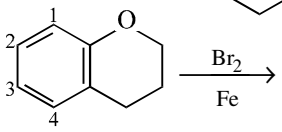
(A) is defined as

(A) 

(B) 

(C) 

(D) 

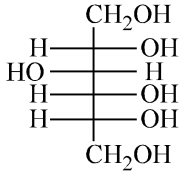
Q.30  substitution take place at the position.

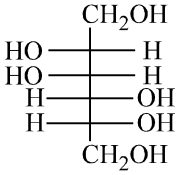
(A) 1 (B) 2 (C) 3 (D) both (A) & (B)

ORGANIC CHEMISTRY
ANSWER KEY

SELF ASSESSMENT SPEED TEST-1

Q.1	C,D	Q.2	B	Q.3	B	Q.4	A,C,D	Q.5	C	Q.6	D	Q.7	D
Q.8	A	Q.9	B	Q.10	C	Q.11	A	Q.12	C	Q.13	A	Q.14	B
Q.15	A,B	Q.16	B,D	Q.17	A	Q.18	A	Q.19	C	Q.20	C	Q.21	C
Q.22	D	Q.23	B	Q.24	B	Q.25	D	Q.26	A	Q.27	A,C,D	Q.28	C
Q.29	A	Q.30	C										

Sorbitol ⟶ 

Mannitol ⟶ 

SELF ASSESSMENT SPEED TEST-2

Q.1	B	Q.2	C	Q.3	C	Q.4	B	Q.5	D	Q.6	A	Q.7	A
Q.8	C	Q.9	D	Q.10	B	Q.11	B	Q.12	B,D	Q.13	A	Q.14	D
Q.15	A	Q.16	C	Q.17	B	Q.18	A						
Q.19	A (This order is only for nucleophilic attack)							Q.20	B	Q.21	D		
Q.22	D	Q.23	A	Q.24	A	Q.25	D	Q.26	A	Q.27	A		
Q.28	D	Q.29	(A) Q, (B) R, (C) P, (D) P					Q.30	(A) Q, (B) S, (C) R, (D) P				

SELF ASSESSMENT SPEED TEST-3

Q.1	A,B,C	Q.2	C,D	Q.3	B	Q.4	A	Q.5	D	Q.6	A	Q.7	D
Q.8	A,C	Q.9	B,C	Q.10	A	Q.11	B,D	Q.12	A	Q.13	A,B,C,D		
Q.14	A,B,C,D			Q.15	C	Q.16	B	Q.17	A	Q.18	D	Q.19	B
Q.20	A	Q.21	A	Q.22	A	Q.23	C	Q.24	A	Q.25	B	Q.26	C
Q.27	A	Q.28	(A) Q, (B) R, (C) P, (D) S					Q.29	(A) S, (B) Q, (C) P, (D) R				
Q.30	(A) R, (B) Q, (C) S, (D) P												

SELF ASSESSMENT SPEED TEST-4

Q.1	C	Q.2	D	Q.3	D	Q.4	B	Q.5	A,B,C	Q.6	A,B		
Q.7	A,B,C	Q.8	A,C	Q.9	B,C	Q.10	B	Q.11	B	Q.12	D	Q.13	B
Q.14	B	Q.15	B,D	Q.16	A,B,C,D			Q.17	C,D	Q.18	B	Q.19	B
Q.20	C	Q.21	D	Q.22	C	Q.23	A	Q.24	D	Q.25	A	Q.26	D
Q.27	(A) S, (B) R, (C) P, (D) Q					Q.28	(A) Q, (B) P, (C) R, (D) S						
Q.29	(A) R, (B) S, (C) None (CCl_4 + NaOH), (D) None(O_3 + H_2O + Zn)												
Q.30	(A) S, (B) R, (C) Q, (D) P												

SELF ASSESSMENT SPEED TEST-5

Q.1	D	Q.2	B	Q.3	B	Q.4	C	Q.5	A	Q.6	C	Q.7	C
Q.8	B	Q.9	B	Q.10	C	Q.11	A	Q.12	D	Q.13	D	Q.14	C
Q.15	C	Q.16	C	Q.17	B	Q.18	A	Q.19	C	Q.20	B	Q.21	A
Q.22	C	Q.23	D	Q.24	C	Q.25	B	Q.26	D	Q.27	A	Q.28	C
Q.29	B	Q.30	C										

" Waves are my inspiration. Not because they rise and fall but because each time they fall, they rise again."

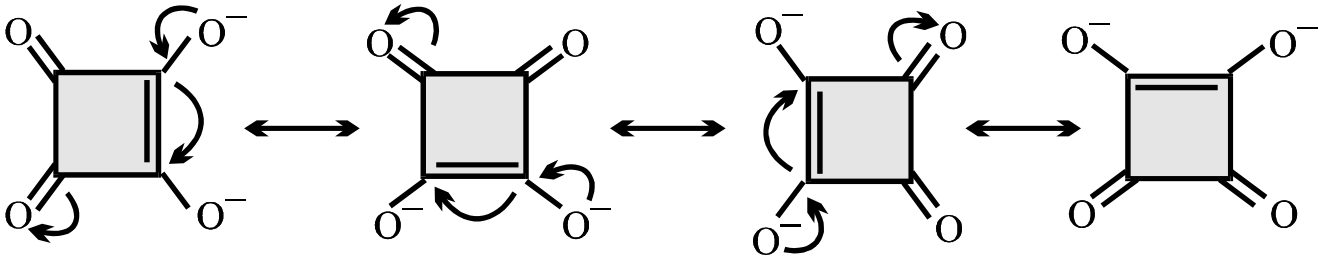
Power Coaching

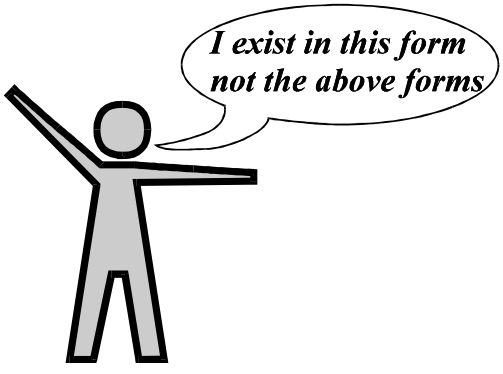
QUEST TUTORIALS

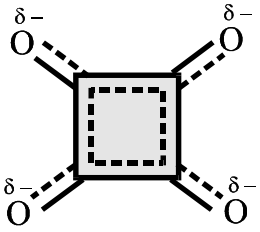
TARGET IIT JEE

ORGANIC CHEMISTRY

RESONANCE



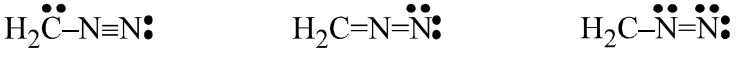




Dianion of Squaric Acid

RESONANCE

Q.1 Consider structural formulas A, B and C:



(A) (B) (C)

(a) Are A, B and C constitutional isomers, or are they resonance forms?
(b) Which structures have a negatively charged carbon?
(c) Which structures have a positively charged carbon?
(d) Which structures have a positively charged nitrogen?
(e) Which structures have a negatively charged nitrogen?
(f) What is the net charge on each structure?
(g) Which is a more stable structure, A or B? Why?
(h) Which is a more stable structure, B or C? Why?

Q.2 In each of the following pairs, determine whether the two represent resonance forms of a single species or depict different substances. If two strictures are not resonance froms, explain why.

(a) 

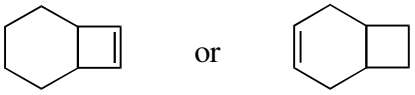
(b) 

(c) 

Q.3 Match each alkene with the appropriate heat of combustion:
Heats of combustion (kJ/mol) : 5293 ; 4658; 4650; 4638; 4632

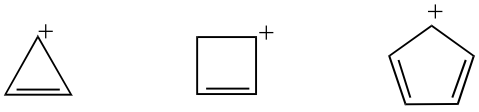
(a) 1-Heptene (b) 2,4-Dimethyl-1-pentene
(c) 2,4-Dimethyl-2-pentene (d) (Z)-4,4-Dimethyl-2-pentene
(e) 2,4,4-Trimethyl-2-pentene

Q.4 Choose the more stable alkene in each of the following pairs. Explain your reasoning.

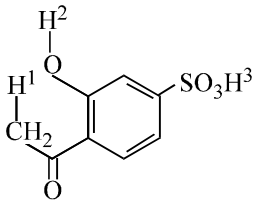
(a) 1-Methylcyclohexene or 3-methylcyclohexene
(b) Isopropenylcyclopentane or allylcyclopentane
(c)  or
(d) (Z)-Cyclononene or (E)-cyclononene
(e) (Z)-Cyclooctadecene or (E)-cyclooctadecene

Q.5 Rank the following sets of intermediates in increasing order of their stability giving appropriate reasons for your choice.

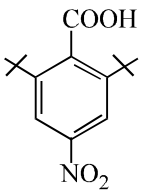
(a) $C_6H_5^+, p-NO_2(C_6H_4)^+, p-CH_3-(C_6H_4)^+, p-Cl-C_6H_4^+$

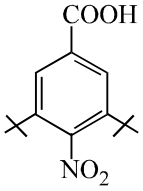
(b) 

Q.6 For the following compounds, arrange the labelled proton in increasing order of their ease of deprotonation.



Q.7 Which is stronger acid, A or B and why?

(A) 

(B) 

Q.8 Discuss the following observations:

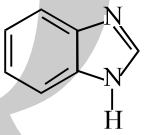
(a) C–Cl bond in vinyl chloride is stronger than in chloroethane.

(b) Carbon-carbon bond length in ethene is shorter than in $CH_2 = CHOCH_3$

(c) CH_3SH is stronger acid than CH_3OH

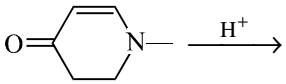
(d) $CH_3CH_2NH_2$ is stronger base than $CH_2 = CHNH_2$.

Q.9 Discuss the basic strenght of two nitrogens in benzimidazole.

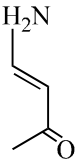


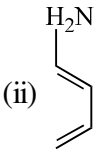
Benzimidazole

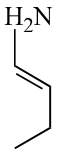
Q.10 In the following structure, which is better site of protonation and why-oxygen or nitrogen?



Q.11 Compare the C–N bond-length in the following species:

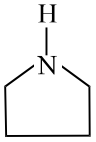
(i) 

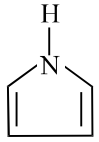
(ii) 

(iii) 

Q.12 Rank the following in increasing order of basic strength, explaining reason for your choice:

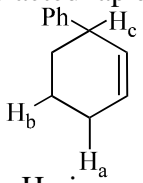
(I) 

(II) 

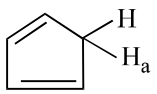
(III) 

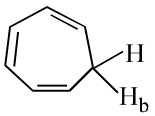
Q.13 Answer the following:

(i) Which of the indicated H is abstracted rapidly by bromine radical and why?



(ii) One of the indicated proton H_a or H_b, is approximately 10^{30} times more acidic than other, which is more acidic and why?

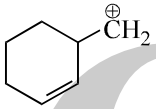
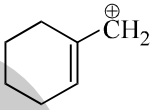




Q.14 In each of the following pairs of ions which ion is more stable:

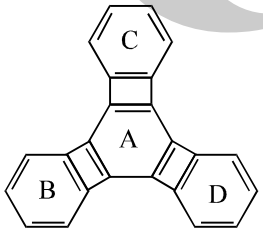
(a) (I) $C_6H_5-\overset{\oplus}{C}H_2$ and (II) $CH_2=CH-\overset{\oplus}{C}H_2$

(b) (I) $CH_3-\overset{\oplus}{C}H_2$ and (II) $CH_2=\overset{\oplus}{C}H$

(c) (I)  and 

(d) (I) $CH_3-\underset{\underset{CH_3-\overset{\oplus}{C}-CH_3}{|}}{CH}-CH_3$ and $CH_3-\underset{\underset{CH_3-\overset{\oplus}{C}-CH_3}{|}}{N}-CH_3$

Q.15 Consider the given reaction:

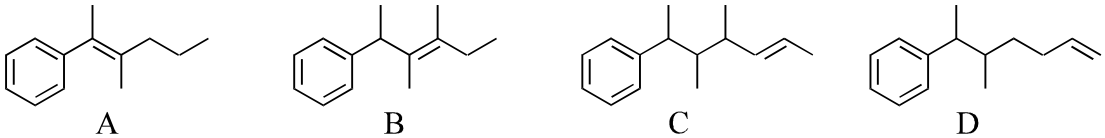


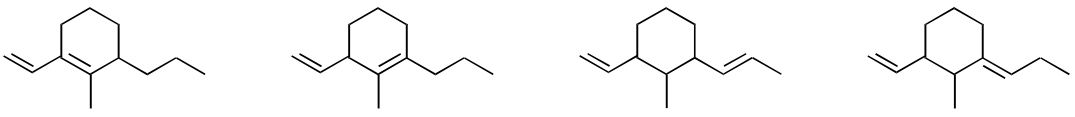
$+ 3H_2 \xrightarrow{Pd/C}$

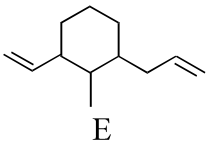
In the above reaction which one of the given ring will undergo reduction?

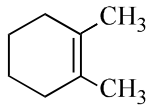
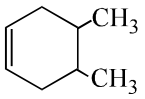
Q.16 Compare heat of hydrogenation (Decreasing order)

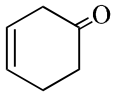
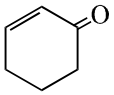
(a) heat of hydrogenation

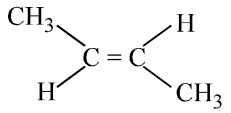
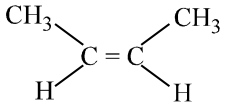
(i) 

(ii) 



(b)  and 

(c)  and 

(d)  and 

(e) $CH_2 = CH - CH \begin{matrix} CH_3 \\ CH_3 \end{matrix}$ and $CH_2 = C \begin{matrix} CH_3 \\ CH_2 - CH_3 \end{matrix}$

Q.17 Which of the following statements is (are) true about resonance.

(a) Resonance is an intramolecular process.

(b) Resonance involves delocalization of both σ and π electrons.

(c) Resonance involves delocalization of π electrons only.

(d) Resonance decreases potential energy of a molecule.

(e) Resonance has no effect on the potential energy of a molecule.

(f) Resonance is the only way to increase molecular stability.

(g) Resonance is not the only way to increase molecular stability.

(h) Any resonating molecule is always more stable than any nonresonating molecule.

(i) The canonical structure explains all features of a molecule.

(j) The resonance hybrid explains all features of a molecule.

(k) Resonating structures are real and resonance hybrid is imaginary.

(l) Resonance hybrid is real and resonating structures are imaginary.

(m) Resonance hybrid is always more stable than all canonical structures.

Q.18 Resonance energy will be more if

(a) canonical structures are equivalent than if canonical structures are non-equivalent.

(b) molecule is aromatic than if molecule is not aromatic.

Q.19 A canonical structure will be more stable if

(a) it has more number of π bonds than if it has less number of π bonds.

(b) the octets of all atoms are complete than if octets of all atoms are not complete.

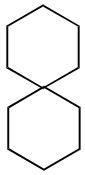
(c) it involves cyclic delocalization of $(4n + 2)\ \pi$ – electrons than if it involves acyclic delocalization of $(4n + 2)\ \pi$ – electrons.

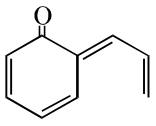
(d) it involves cyclic delocalization $(4n)\ \pi$ – electrons than if it involves acyclic delocalizationof $(4n)\ \pi$ – electrons.

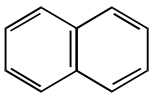
(e) +ve charge is on more electronegative atom than if +ve charge is on less electronegative atoms.

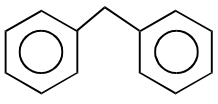
(f) –ve charge is on more electronegative atom than if –ve

Q.20 In which of the following molecules resonance takes place through out the entire system.

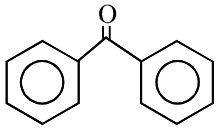
(a) 

(b) 

(c) 

(d) 

(e) $\begin{matrix} COOCH_3 \\ | \\ COOCH_3 \end{matrix}$

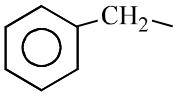
(f) 

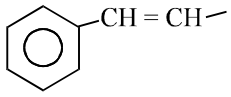
Q.21 Which of the following groups cannot participate in resonance with other suitable group :

(a) – COOH (b) $-CO\overline{O}$ (c) – COCl (d) $-\overset{\oplus}{N}H_3$

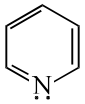
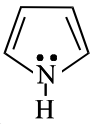
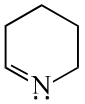
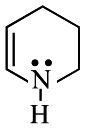
(e) $-\overset{\oplus}{C}H_2$ (f) $-\dot{C}H_2$ (g) $CH_2=\overset{\oplus}{N}-$ with CH_3 below N

Q.22 Which of the following group can participate in resonance with other suitable group :

(a) $CH_2=\overset{\oplus}{O}-$ (b) $-CH_2-\overline{C}H_2$ (c) $-CH_2-\overset{\oplus}{C}H_2$ (d) 

(e)  (f) $-BH_2$ (g) $-\overset{\oplus}{P}Ph_3$

Q.23 In which of the following lone-pair indicated is involved in resonance :

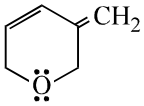
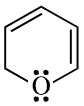
(a)  (b)  (c)  (d) 

(e) $CH_2=CH-C\overset{\Theta}{H}_2$ (f) $CH_2=CH-CH=\ddot{N}H$

Q.24 In which of the following lone-pair indicated is not involved in resonance :

(a) $CH_2=CH-\ddot{N}H-CH_3$ (b) $CH_2=CH-CH=\ddot{O}$

(c) $CH_2=CH-\ddot{O}-CH=CH_2$ (d) $CH_2=CH-C\equiv N:$

(e)  (f) 

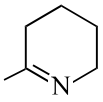
Q.25 Identify electron – donating groups in resonance among the following :

(a) $-CONH_2$ (b) $-NO_2$ (c) $-OCOCH_3$ (d) $-COOCH_3$

(e) – CHO (f) $-NHCOCH_3$

Q.26 Identify electron – withdrawing groups in resonance among the following :

(a) – COOH (b) $-CONHCH_3$ (c) – COCl (d) – CN

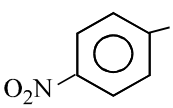
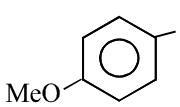
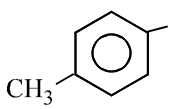
(e) $-O-CH=CH_2$ (f) 

Q.27 Which of the following groups can either donate or withdraw a pair of electrons in resonance depending upon situation :

(a) $-NO_2$ (b) – NO (c) – CH = CH (d) – CHO

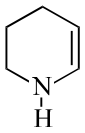
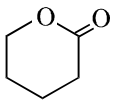
(e) $-NH_2$ (f) – N = NH

Q.28 Which of the following groups can only withdraw a pair of electrons in resonance depending upon situation :

(a) – Ph (b)  (c)  (d) 

(e) $-\overset{\oplus}{N}Me_3$ (f) $-CONH_2$

Q.29 Write the resonance hybrid of each of the following :

(a) $CH_2 = CH - \overline{C}H_2$ (b)  (c)  (d) $CH_2 = CH - \overset{\oplus}{C}H_2$

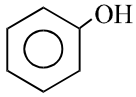
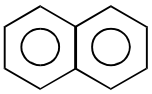
(e) $CH_2 = CH - CH_2$

Q.30 Write the canonical structures of each of the following :

(a) $R - CO - CH = CH_2$ (b) $CH_3O - CH = CH - \overset{\oplus}{N}Me_3$

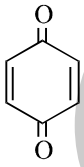
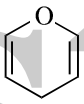
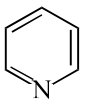
(c) RCOCl (d) $HCONH_2$ (e) 

Q.31 Write the resonance hybrid of each of the following :

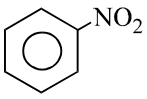
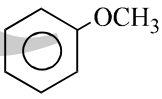
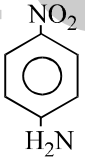
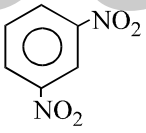
(a)  (b) $CH_2 = CH - CH = O$ (c) $CH_2 = C = \overline{C}H$ (d) 

(e) $CH_2 = CH - CH = CH_2$

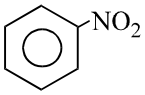
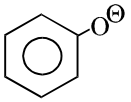
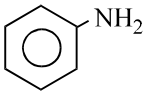
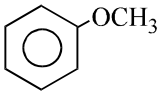
Q.32 Write the canonical structures of each of the following :

(a)  (b) $CH_2 = \overset{\oplus}{N} = \overline{N}$ (c) $CH_2 = C = O$ (d)  (e) 

Q.33 In which of the following molecules π – electron density in ring is minimum :

(A)  (B)  (C)  (D) 

Q.34 In which of the following molecules π – electron density in ring is maximum :

(A)  (B)  (C)  (D) 

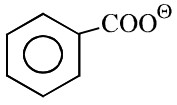
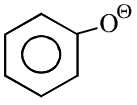
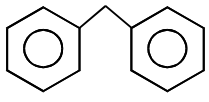
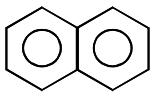
Q.35 $CH_2 = CH - CH = CH - CH_3$ is more stable than $CH_3 - CH = C = CH - CH_3$ because
(I) (II)

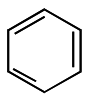
(A) there is resonance in I but not in II (B) there is tautomerism in I but not in II

(C) there is hyperconjugation in I but not in II (D) II has more cononical structures than I.

Q.36 Which of the following pairs has higher resonance energy :

(a) CH_3COOH and CH_3COONa (b) $CH_2 = CH - \overset{\Theta}{O}$ and $CH_2 = CH - OH$

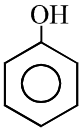
(c)  and  (d)  and 

(e)  and $CH_2 = CH - CH = CH - CH = CH_2$

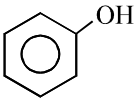
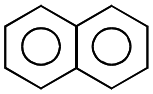
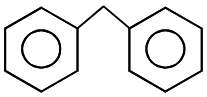
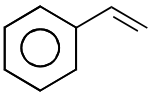
Q.37 Which of the following pairs has less resonance energy :

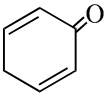
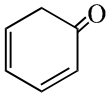
(a) CO_3^{2-} and $HCOO^-$ (b)  and $CH_2 = CH - \overset{-}{C}H_2$

(c)  and $CH_2 = CH - CH = CH_2$ (d)  and $CH_2 = CH - \overset{\oplus}{C}H_2$

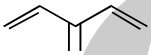
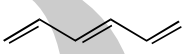
(e)  and 

Q.38 Which of the following pairs has higher resonance energy :

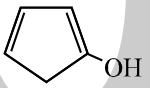
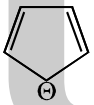
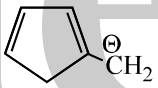
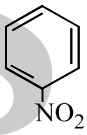
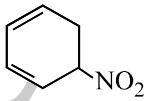
(a)  and  (b)  and 

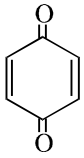
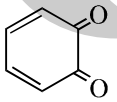
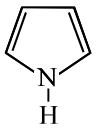
(c)  and 

(d) $CH_2 = CH - OH$ and $CH_2 = CH - CH = CH - OH$

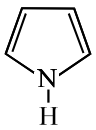
(e)  and 

Q.39 Which of the following pairs has less resonance energy :

(a)  and  (b)  and  (c)  and 

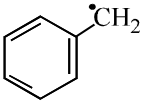
(d)  and  (e)  and 

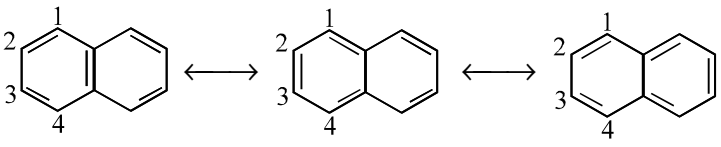
Q.40 Which of the following pairs has higher resonance energy :

(a)  and 

(b) $CH_2 = CH - O - CH = CH_2$ and $CH_2 = CH - NH - CH = CH_2$

(c) $CH_2 = CH - \overset{\ominus}{N}H$ and $HN = CH - \overset{\ominus}{N}H$ (d) $CH_2 = CH - F$ and $CH_2 = CH - Br$

(e)  and $CH_2 = CH - \dot{C}H_2$

Q.41 

These are three canonical structures of naphthalene. Examine them and find correct statement among the following :

(A) All C – C bonds are of same length (B) CI – C2 bond is shorter than C2 – C3 bond.

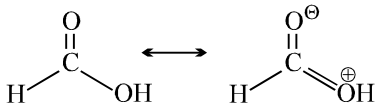
(C) C1 – C2 bond is longer than C2 – C3 bond (D) none.

Q.42 Which of the following is (are) the correct order of bond lengths :

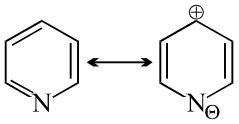
(A) C – C > C = C > C ≡ C > C ≡ N (B) C = N > C = O > C = C

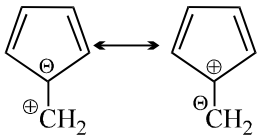
(C) C = C > C = N > C = O (D) C – C > C = C > C ≡ C > C – H

Q.43 Identify more stable canonical structure in each of the following pairs :

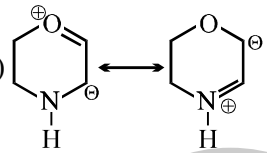
(a) 

(b) $\overset{\ominus}{C}H_2 - C \equiv CH \longleftrightarrow CH_2 = C = \overset{\ominus}{C}H$

(c) 

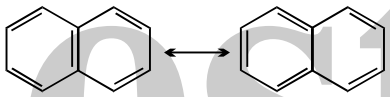
(d) 

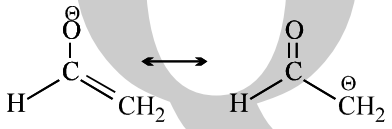
(e) $\overset{\oplus}{C}H_2 - CH = CH - \overset{\ominus}{O} \longleftrightarrow CH_2 = CH - CH = O$

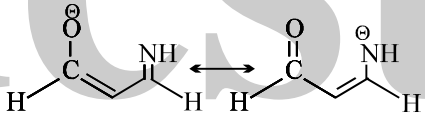
(f) 

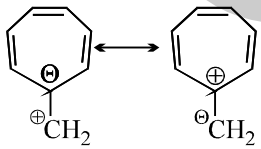
Q.44 Identify less stable canonical structure in each of the following pairs :

(a) $\overset{\oplus}{C}H_2 - O - CH_3 \longleftrightarrow CH_2 = \overset{\oplus}{O} - CH_3$

(b) 

(c) 

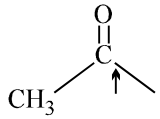
(d) 

(e) 

Q.45 In which of the following pairs, indicated bond is of greater strength :

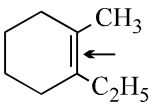
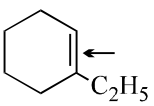
(a) $CH_3 - CH_2 \underset{\uparrow}{-} Br$ and $CH_3 - CH_2 \underset{\uparrow}{-} Cl$

(b) $CH_3 - CH = CH \underset{\uparrow}{-} Br$ and $CH_3 \underset{\rightarrow|}{-} CH - CH_3$ (Br)

(c)  and $CH_3 - CH_2 \underset{\uparrow}{-} Cl$

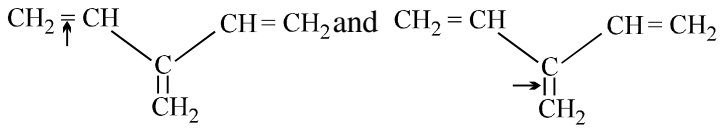
(d) $CH_2 = CH \underset{\uparrow}{-} CH = CH_2$ and $CH_2 = CH_2 \underset{\uparrow}{-} CH_2 - CH_3$

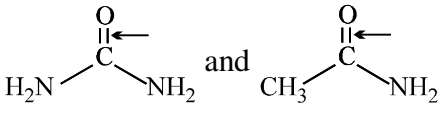
(e) $CH_2 = CH \underset{\uparrow}{-} CH = CH_2$ and $CH_2 = CH \underset{\uparrow}{-} NO_2$

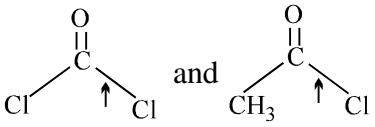
(f)  and 

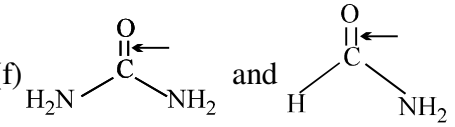
Q.46 In which of the following pairs, indicated bond having less bond dissociation energy :

(a)  and $CH_2 \overset{\uparrow}{=} CH_2$ (b) $CH_3 - C \overset{\uparrow}{\equiv} CH$ and $HC \overset{\uparrow}{\equiv} CH$

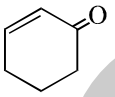
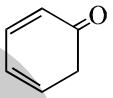
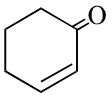
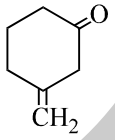
(c) 

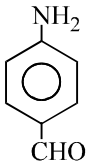
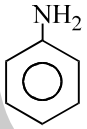
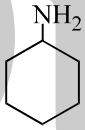
(d) 

(e) 

(f) 

Q.47 Which of the following has longest C – O bond :

(A)  (B)  (C)  (D) 

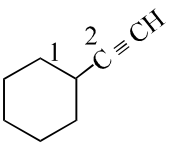
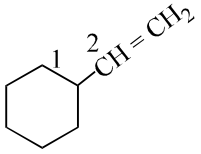
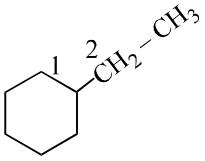
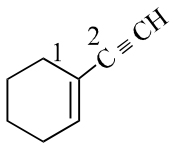
Q.48    $CH_2 = NH$

I II III IV

Among these compounds, the correct order of C – N bond lengths is :

(A) IV > I > II > III (B) III > I > II > IV (C) III > II > I > IV (D) III > I > IV > II

Q.49 C1 – C2 bond is shortest in

(A)  (B)  (C)  (D) 

Q.50 Among the following molecules, the correct order of C – C bond lenght is

(A) $C_2H_6 > C_2H_4 > C_6H_6 > C_2H_2$ (B) $C_2H_6 > C_6H_6 > C_2H_4 > C_2H_2$($C_6H_6$ is benzene)

(C) $C_2H_4 > C_2H_6 > C_2H_2 > C_6H_6$ (D) $C_2H_6 > C_2H_4 > C_2H_2 > C_6H_6$

Q.51 $CH_3O - CH = CH - NO_2$ I

$CH_2 = CH - NO_2$ II

$CH_2 = CH - Cl$ III

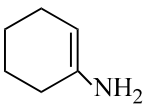
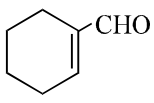
$CH_2 = CH_2$ IV

Which of the following is the correct order of C – C bond lengths among these compounds :

(A) I > II > III > IV (B) IV > III > II > I (C) I > III > II > IV (D) II > III > I > IV

Q.52 In which of the following molecules resonance is equivalent :

(A) $HCOO^{\ominus}$ (B) $CH_2 = CH - CH = CH_2$

(C)  (D) 

Q.53 $CH_2 = CH - CH = CH - CH = CH_2$ I

$CH_2 = CH - \overset{\oplus}{C}H - CH = CH - \overset{\ominus}{C}H_2$ II

$\overset{\oplus}{C}H_2 - CH = CH - CH = CH - \overset{\ominus}{C}H_2$ III

Among these three canonical structures (through more are possible) what would be their relative contribution in the hybrid :

(A) I > II > III (B) III > II > I (C) I > III > II (D) III > I > II

Q.54 For 1-methoxy-1, 3-butadiene, which of the following resonating structure is the least stable?

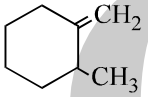
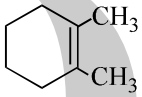
(A) $H_2\overset{\ominus}{C} - \overset{\oplus}{C}H - CH = CH - O - CH_3$ (B) $H_2\overset{\ominus}{C} - CH = CH - CH = \overset{\oplus}{O} - CH_3$

(C) $H_2C = CH - \overset{\oplus}{C}H - \overset{\ominus}{C}H - O - CH_3$ (D) $H_2C = CH - \overset{\ominus}{C}H - CH = \overset{\oplus}{O} - CH_3$

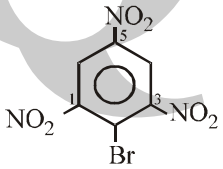
Q.55 Among the following pairs identify the one which gives higher heat of hydrogenation :

(a)  and  (b)  and 

(c) $CH_3 - CH = CH - CH_3$ and $CH_3 - CH_2 - CH = CH_2$

(d)  and 

Q.56 Which of the following statements would be true about this compound :



(A) All three C – N bonds are of same length.

(B) Cl – N and C3 – N bonds are of same length but shorter than C5 – N bond.

(C) Cl – N and C3 – N bonds are of same length but longer than C5 – N bond.

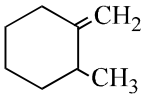
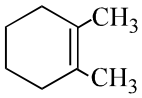
(D) Cl – N and C3 – N bonds are of different length but both are longer than C5 – N bond.

Q.57 Write resonating structures of σ complex formed when an electrophile ($E^{\oplus}$) attacks on (i) α and (ii) β position of naphthalene. Also state which is more stable.

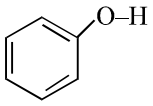
Q.58 Among the following pairs identify the one which gives higher heat of hydrogenation :

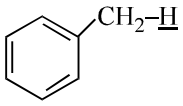
(a)  and  (b)  and 

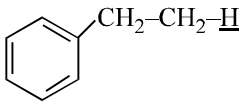
(c) $CH_3 - CH = CH - CH_3$ and $CH_3 - CH_2 - CH = CH_2$

(d)  and 

Q.59 Number the following compounds in order of increasing acidity of indicated proton giving mechanistic reasoning:


I


II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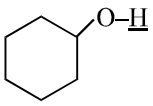
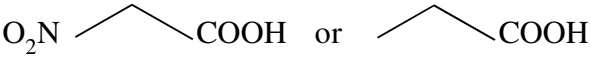
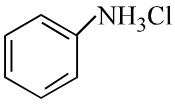
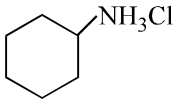
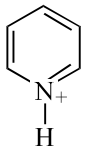
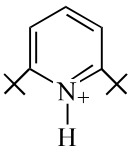

IV

Q.60 From the following pair, select the stronger acid providing clear reasoning:

(a) 

(b)  or 

(c)  or 

ANSWER KEY

Q.1	a = Resonance form, b= A, c = C, d= A & B, e=B&C, f = B, g = B, h = B						
Q.2	(a) are resonance form			Q.3	(a) 4658, (b) 4638, (c) 4632, (d) 4656, (e) 5293		
Q.4	(a) i , (b) i , (c) ii, (d) i, (e) ii			Q.5	(a) ii < iv < i < iii, (b) iii < ii < i		
Q.6	1<2<3	Q.7	A = i	Q.11	iii > ii > i	Q.12	III < II < I
Q.13	(i) H_c (ii) H_a	Q.14	(a) I, (b) I, (c) II, (d) II			Q.15	A
Q.17	(a), (c), (d), (g), (j), (l), (m)			Q.18	(a), (b)		
Q.19	(a), (b), (c), (f)	Q.20	(b), (c)	Q.21	(d)	Q.22	(a), (e), (f), (g)
Q.23	(b), (d), (e)	Q.24	(b), (d), (e)	Q.25	(c), (f)		
Q.26	(a), (b), (c), (d), (f)	Q.27	(b), (c), (f)	Q.28	(f)	Q.33	D
Q.34	B	Q.35	A	Q.36	(a) II, (b) I, (c) I, (d) I, (e) I		
Q.37	(a) II, (b) I, (c) I, (d) II , (e) I			Q.38	(a) II, (b) I, (c) II, (d) II, (e) II		
Q.39	(a) II, (b) II, (c) II, (d) II, (e) II			Q.40	(a) I, (b) II, (c) II, (d) I, (e) I		
Q.41	B	Q.42	A,C,D	Q.43	(a) I, (b) I, (c) I, (d) I, (e) II, (f) II		
Q.44	(a) I, (b) II, (c) II, (d) II, (e) I			Q.45	(a) II, (b) I, (c) I, (d) I, (e) II, (f) II		
Q.46	(a) I, (b) I, (c) II, (d) I, (e) I, (f) I			Q.47	B	Q.48	C
Q.49	D	Q.50	B	Q.51	A	Q.52	A
Q.53	C	Q.54	C	Q.55	(a) I, (b) I, (c) II, (d) I		
Q.56	C	Q.57	$E^{\oplus}$ attack on α is more stable			Q.58	(a) I, (b) I, (c) II, (d) I
Q.59	III < II < IV < I	Q.60	(a) I, (b) I , (c) II				

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QUEST TUTORIALS

TARGET IIT JEE

INORGANIC CHEMISTRY

COORDINATION COMPOUNDS

Q.1 Among TiF_6^{2-}, CoF_6^{3-}, Cu_2Cl_2 and $NiCl_4^{2-}$ the coloureless species are:

(A) CoF_6^{3-} and $NiCl_4^{2-}$ (B) TiF_6^{2-} and CoF_6^{3-}

(C) $NiCl_4^{2-}$ and Cu_2Cl_2 (D) TiF_6^{2-} and Cu_2Cl_2

Q.2 IUPAC name of complex $K_3[Al(C_2O_4)_3]$ is :

(A) Potassium alumino-oxalate (B) Potassium trioxalatoaluminate (III)

(C) Potassium aluminium (III) oxalate (D) Potassium trioxalatoaluminate (IV)

Q.3 Which ion has tetrahedral geometry:

(A) $[Fe(CO)_5]$ (B) $[Co(NH_3)_6]^{2+}$ (C) $[NiCl_4]^{2-}$ (D) $[Ni(CN)_4]^{2-}$

Q.4 Trioxalato aluminate (III) and tetrafluoro-borate (III) ions are:

(A) $[Al(C_2O_4)_3]$, $[BF_4]^{3-}$ (B) $[Al(C_2O_4)_3]^{3+}$, $[BF_4]^{3+}$

(C) $[Al(C_2O_4)_3]^{3-}$, $[BF_4]^{-}$ (D) $[Al(C_2O_4)_3]^{2-}$, $[BF_4]^{2-}$

Q.5 Which of the ligands can show linkage isomerism:

(A) CNS (B) NO_2 (C) CN (D) All of these

Q.6 Consider the following statements:
According the Werner's theory.
(1) Ligands are connected to the metal ions by covalent bonds.
(2) Secondary valencies have directional properties
(3) Secondary valencies are non-ionisable
Of these statements:

(A) 1, 2 and 3 are correct (B) 2 and 3 are correct

(C) 1 and 3 are correct (D) 1 and 2 are correct

Q.7 From the stability constant (hypothetical values), given below, predict which is the strongest ligand:

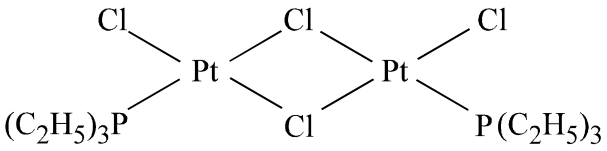
(A) $Cu^{2+} + 4NH_3 \rightleftharpoons [Cu(NH_3)_4]^{2+}$, $K = 4.5 \times 10^{11}$

(B) Cu^{2+} $4CN^- \rightleftharpoons [Cu(CN)_4]^{2-}$, $K = 2.0 \times 10^{27}$

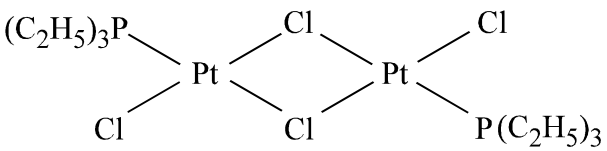
(C) $Cu^{2+} + 2en \rightleftharpoons [Cu(en)_2]^{2+}$, $K = 3.0 \times 10^{15}$

(D) $Cu^{2+} + 4H_2O \rightleftharpoons [Cu(H_2O)_4]^{2+}$, $K = 9.5 \times 10^{8}$

Q.8 The complexes given below show:



and



(A) Optical isomerism (B) Co-ordination isomerism

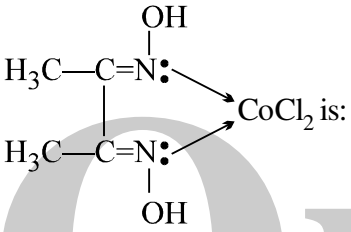
(C) Geometrical isomerism (D) Bridged isomerism

Q.9 In which of the following complexes the nickel metal is in highest oxidation state:
(A) $Ni(CO)_4$ (B) K_2NiF_6 (C) $[Ni(NH_3)_6](BF_4)_2$ (D) $K_4[Ni(CN)_6]$

Q.10 An ion M^{2+}, forms the complexes $[M(H_2O)_6]^{2+}$, $[M(en)_3]^{2+}$ and $[MBr_6]^{4-}$, match the complex with the appropriate colour.
(A) Green, blue and red (B) Blue, red and green
(C) Green, red and blue (D) Red, blue and green

Q.11 Name the metal M which is extracted on the basis of following reactions:
$4M + 8CN^- + 2H_2O + O_2 \longrightarrow 4[M(CN)_2]^- + 4OH^-$
$2[M(CN)_2]^- + Zn \longrightarrow [Zn(CN)_4]^{2-} + 2M$
(A) Nickel (B) Silver (C) Copper (D) Mercury

Q.12 The correct IUPAC name of the complex:



(A) Dichlorodimethylglyoximate cobalt (II) (B) Bis (dimethyglyoxime) dichloro cobalt (II)
(C) Dimethylglyoxime cobalt (II) chloride (D) Dichlorodimethylglyoxime cobalt (II)

Q.13 $[(C_6H_5)_2 Pd (SCN)_2]$ and $[(C_6H_5)_2 Pd (NCS)_2]$ are:
(A) Linkage isomers (B) Co-ordination isomers
(C) Ionisation isomers (D) Geometrical isomers

Q.14 Which one of the following square planar complex will be able to show cis-trans isomerism:
(A) MA_3B (B) $M(AA)_2$ (C) MABCD (D) MA_4

Q.15 A complex of platinum, ammonia and chloride produces four ions per molecule in the solution. The structure consistent with the observation is:
(A) $[Pt(NH_3)_4]Cl_4$ (B) $[Pt(NH_3)_2Cl_4]$ (C) $[Pt(NH_3)_5Cl]Cl_3$ (D) $[Pt(NH_3)_4Cl_2]Cl_2$

Q.16 The total number of possible isomers of the compound $[Cu^{II}(NH_3)_4]\,[Pt^{II}Cl_4]$ are:
(A) 3 (B) 5 (C) 4 (D) 6

Q.17 In the complex $Fe(CO)_x$, the value of x is:
(A) 3 (B) 4 (C) 5 (D) 6

Q.18 Cis-trans-isomerism is found in square planar complexes of the molecular formula : (A and B are monodenate ligands):
(A) MA_4 (B) MA_3B (C) MA_2B_2 (D) MAB_3

Q.19 The oxidation state of Mo in its oxo-complex species $[Mo_2O_4(H_2O)_2(C_2H_4)_2]^{2-}$ is:
(A) +2 (B) +3 (C) +4 (D) +5

Q.20 The hydridisation and unpaired electrons in $[Fe(H_2O)_6]^{2+}$ ion are :
(A) sp^3d^2 ; 4 (B) d^2sp^3 ; 3 (C) sp^3d ; 4 (D) $sp^3\,d^2$; 2

Q.21 In which complex is the transition metal in zero oxidation state:
(A) $[Co(NH_3)_6]Cl_2$ (B) $[Fe(H_2O)_6SO_4]$ (C) $[Ni(CO)_4]$ (D) $[Fe(H_2O)_3](OH)_2$

Q.22 Formula of ferrocene is:
(A) $[Fe(CN)_6]^{4-}$ (B) $[Fe(CN)_6]^{3+}$ (C) $[Fe(CO)_5]$ (D) $[(C_5H_5)_2Fe]$

Q.23 The hybrisation involved in $[CoF_6]^{3-}$ is:
(A) d^2sp^3 (B) d^3sp^2 (C) dsp^3 (D) sp^3d^2

Q.24 Which of the following is π complex:
(A) Trimethyl aluminium (B) Ferrocene
(C) Diethyl zinc (D) Nickel carbonyl

Q.25 Which complex is likely to show optical activity:
(A) Trans-$[Co(NH_3)_4Cl_2]^+$ (B) $[Cr(H_2O)_6]^{3+}$
(C) Cis-$[Co(NH_3)_2(en)_2]^{3+}$ (D) Trans-$[Co(NH_3)_2(en)_2]^{3+}$

Q.26 Which one is the most likely structure of $CrCl_3 \cdot 6H_2O$ if 1/3 of total chlorine of the compound is precipitate by adding $AgNO_3$ to its aqueous solution:
(A) $CrCl_3 \cdot 6H_2O$ (B) $[Cr(H_2O)_3Cl_3] \cdot (H_2O)_3$
(C) $[CrCl_2(H_2O)_4] \cdot Cl \cdot 2H_2O$ (D) $[CrCl(H_2O)_5]Cl_2 \cdot H_2O$

Q.27 The complex $[Co(NH_3)_5Br]SO_4$ will give white ppt. with:
(A) $PbCl_2$ (B) $AgNO_3$ (C) KI (D) None of these

Q.28 The two compounds $[Co(SO_4)(NH_3)_5]Br$ and $[Co(SO_4)(NH_3)_5]Cl$ represent:
(A) Linkage isomerism (B) Ionisation isomerism
(C) Co-ordination isomerism (D) No isomerism

Q.29 The structure of iron pentacarbonyl is:
(A) Square planar (B) Trigonal bipyramid (C) Triangular (D) None of these

Q.30 The EAN of platinum in potassium hexachloroplatinate (IV) is:
(A) 46 (B) 86 (C) 36 (D) 84

Q.31 Diethylene triamine is:
(A) Chelating agent (B) Polydentate ligand (C) Tridentate ligand (D) All of these

Q.32 How many moles of AgCl would be obtained, when 100 ml of 0.1 M $Co(NH_3)_5Cl_3$ is treated with excess of $AgNO_3$?
(A) 0.01 (B) 0.02 (C) 0.03 (D) none of these

Q.33 0.001 mol of $Co(NH_3)_5(NO_3)(SO_4)$ was passed through a cation exchanger and the acid coming out of it required 20 ml of 0.1 M NaOH for neutralisation. Hence, the complex is
(A) $[Co(NH_3)_5SO_4]NO_3$ (B) $[Co(NH_3)_5NO_3]SO_4$
(C) $[Co(NH_3)_5](SO_3)(NO_3)$ (D) none of these

Q.34 Cu^{2+} shows a coordination number of
(A) 2 only (B) 2 or 4 (C) 4 only (D) 4 or 6

Q.35 Which of the following is not chelating agent?
(A) thiosulphato (B) oxalato (C) glycinato (D) ethylene diamine

Q.36 Which of the following has five donor (coordinating) sites?
(A) Triethylene tetramine (B) Ethylenediamine tetracetate ion
(C) Ethylenediamine triacetate ion (D) Diethylene triamine

Q.37 A compound contains 1.08 mol of Na, 0.539 mol of Cu and 2.16 mol of F. Its aqueous solution shows osmotic pressure which is three times that of urea having same molar concentration. The formula of the compound is
(A) $Na_4[CuF_6]$ (B) $Na[CuF_4]$ (C) $Na_2[CuF_4]$ (D) $Na_2[CuF_3]$

Q.38 The IUPAC name of the red coloured complex $[Fe(C_4H_7O_2N_2)_2]$ obtained from the reaction of Fe^{2+} and dimethyl glyoxime
(A) bis (dimethyl glyoxime) ferrate (II) (B) bis (dimethyl glyoximato) iron (II)
(C) bis (2, 3-butanediol dioximato) iron (II) (D) bis (2, 3-butanedione dioximato) iron (II)

Q.39 The molar ionic conductances of the octahedral complexes.
(1) $PtCl_4 \cdot 5NH_3$ (2) $PtCl_4 \cdot 4NH_3$ (3) $PtCl_4 \cdot 3NH_3$ (4) $PtCl_4 \cdot 2NH_3$
(A) I < II < III < IV (B) IV < III <II < I (C) III < IV < II < I (D) IV < III < I < II

Q.40 On treatment of 10 ml of 1M solution of the complex $CrCl_3 \cdot 6H_2O$ with excess of $AgNO_3$, 4.305 g of AgCl was obtained. The complex is
(A) $[Cr(H_2O)_3Cl_3] \cdot 3H_2O$ (B) $[Cr(H_2O)_4Cl_2]Cl \cdot 2H_2O$
(C) $[Cr(H_2O)_5Cl]Cl_2 \cdot H_2O$ (D) $[Cr(H_2O)_6Cl_3$

Q.41 Which of the following species is not expected to be a ligand
(A) $\overset{+}{N}O$ (B) NH_4^+ (C) $NH_2 - NH_3^+$ (D) CO

Q.42 The number of donor sites in dimethyl glyoxime, glycinato, diethylene triamine and EDTA are respectively:
(A) 2, 2, 3 and 4 (B) 2, 2, 3 and 6 (C) 2, 2, 2 and 6 (D) 2, 3, 3 and 6

Q.43 EAN of the central metal in the complexes – $K_2[Ni(CN_4)]$, $[Cu(NH_3)_4]SO_4$ and $K_2[PtCl_6]$ are respectively.
(A) 36, 35, 86 (B) 34, 35, 84 (C) 34, 35, 86 (D) 34, 36, 86

Q.44 Which of the following pair of complexes have the same EAN of the central metal atoms/ions?
(A) $[Cu(NH_3)_4]SO_4$ and $K_3[Fe(CN)_6]$ (B) $K_4[Fe(CN)_6]$ and $[Co(NH_3)_6]Cl_3$
(C) $K_3[Cr(C_2O_4)_3$ and $[Cr(NH_3)_6]Cl(NO_2)_2$ (D) all

Q.45 The complex that violates the Sidgwicks's rule of EAN is
(A) Potassium ferrocyanide (B) Hexamine cobalt (III) Chloride
(C) Tetramine copper (II) sulphate (D) Potassium dichlorodioxalato cobaltate (III)

Q.46 The IUPAC name for the coordination compound $Ba[BrF_4]_2$ is
(A) Barium tetrafluorobromate (V) (B) Barium tetrafluorobromate (III)
(C) Barium bis (tetrafluorobromate) (III) (D) none of these

Q.47 The formula of the complex hydridotrimethoxoborate (III) ion is:
(A) $[BH(OCH_3)_3]^{2-}$ (B) $[BH_2(OCH_3)_3]^{2-}$ (C) $[BH(OCH_3)_3]^-$ (D) $[BH(OCH_3)_3]^+$

Q.48 The complex ion which has no 'd' electrons in the central metal atom is:
(A) $[Co(NH_3)_6]^{3+}$ (B) $[Fe(CN)_6]^{3-}$ (C) $[Cr(H_2O)_6]^{3+}$ (D) $[MnO_4]^-$

Q.49 Oxidation number of Fe in violet coloured complex $Na_4[Fe(CN)_5(NOS)]$ is:
(A) 0 (B) 2 (C) 3 (D) 4

Q.50 Complexes $[Co(NH_3)_5SO_4]Br$ and $[Co(NH_3)_5Br]SO_4$ can be distinguished by
(A) conductance measurement (B) using $BaCl_2$
(C) using $AgNO_3$ (D) all

Q.51 Amongst the following ions, which one has the highest paramagnetism?
(A) $[Cr(H_2O)_6]^{3+}$ (B) $[Fe(H_2O)_6]^{2+}$ (C) $[Zn(H_2O)_6]^{2+}$ (D) $[Cu(H_2O)_6]^{2+}$

Q.52 $Ni(CO)_4$ and $[Ni(NH_3)_4]^{2+}$ do not differ in
(A) magnetic moment (B) oxidation number of Ni
(C) geometry (D) EAN

Q.53 Which of the following statements is not correct?
(A) $Ti(NO_3)_4$ is a colourless compound (B) $[Cr(NH_3)_6)]Cl_3$ is a coloured compound
(C) $K_3[VF_6]$ is a colourless compound (D) $[Cu(NCCH_3)_4]BF_4$ is a colourless compound

Q.54 The geometry of $Ni(CO)_4$ and $[Ni(P\,Ph_3)_2Cl_2]$ are
(A) both square planar (B) tetrahedral and square planar
(C) both tetrahedral (D) square planar and tetrahedral

Q.55 Of the following which is diamagnetic in nature?
(A) $[CoF_6]^{3-}$ (B) $[NiCl_4]^{2-}$ (C) $[CuCl_4]^{2-}$ (D) $[Ni(CN)_4]^{2-}$

Q.56 The $[Fe(CN)_6]^{3-}$ complex ion
(A) exhibits planar geometry (B) is diamagnetic
(C) should be very stable (D) has 2 unpaired electrons

Q.57 50 ml of 0.2 M solution of a compound with empirical formula $CoCl_3.4NH_3$ on treatment with excess of $AgNO_3$(aq) yields 1.435 g of AgCl. Ammonia is not removed by treatment with concentrated H_2SO_4. The formula of the compound is:
(A) $Co(NH_3)_4Cl_3$ (B) $[Co(NH_3)_4Cl_2]Cl$ (C) $[Co(NH_3)_4Cl_3$ (D) $[CoCl_3(NH_3)]NH_3$

Q.58 In the process of extraction of gold,

Roasted gold ore $+CN^- + H_2O \xrightarrow{O_2} [x] + OH^-$; $[x] + Zn \longrightarrow [y] + Au$

[x] and [y] are:
(A) $[x] = [Au(CN)_2]^-$, $[y] = [Zn(CN)_4]^{2-}$ (B) $[x] = [Au(CN)_4]^{3-}$, $[y] = [Zn(CN)_4]^{2-}$
(C) $[x] = [Au(CN)_2]^-$, $[y] = [Zn(CN)_6]^{4-}$ (D) $[x] = [Au(CN)_4]^-$, $[y] = [Zn(CN)_4]^{2-}$

Q.59 Which of the following is non–conducting?
(A) $CoCl_3.6NH_3$ (B) $CoCl_3.5NH_3$ (C) $CoCl_3.4NH_3$ (D) $CoCl_3.3NH_3$

Q.60 Aqueous solution of $FeSO_4$ gives tests for both Fe^{2+} and SO_4^{2-} but after addition of excess of KCN, solution ceases to give test for Fe^{2+}. This is due to the formation of
(A) the double salt $FeSO_4.2KCN.6H_2O$ (B) $Fe(CN)_3$
(C) the complex ion $[Fe(CN)_6]^{4-}$ (D) the complex ion $[Fe(CN)_6]^{3-}$

Q.61 Which of the following statement(s) is/are correct with reference to Fe^{2+} and Fe^{3+} ions?
(1) Fe^{3+} gives brown colour with potassium ferricyanide
(2) Fe^{2+} gives blue colour with potassium ferricyanide
(3) Fe^{3+} gives red colour with potassium thiocyanate
(4) Fe^{2+} gives brown colour with ammonium thiocyanate
(A) 1, 2 (B) 1, 4 (C) 1, 2, 3 (D) all of these

Q.62 The number of sigma bonds in Ziese's salt is:
(A) 4 (B) 6 (C) 8 (D) none of these

Q.63 The disodium salt of ethylene diamine tetracetic acid can be used to estimate the following ion(s) in the aqueous solution
(A) Mg^{2+} ion (B) Ca^{2+} ion (C) Na^+ ion (D) both Mg^{2+} and Ca^{2+}

Q.64 The oxidation number of Co in the complex ion $[(en)_2Co\begin{matrix}NH\\OH\end{matrix}Co(en)_2]^{3+}$
(A) +2 (B) +3 (C) +4 (D) +6

Q.65 $[Cu(NH_3)_4]^{2+}$ has hybridisation and magnetic moment
(A) sp^3, 1.73 B.M. (B) sp^3d, 1.73 B.M. (C) dsp^2, 2.83 B.M. (D) dsp^2, 1.73 B.M.

Q.66 $[FeF_6]^{3-}$ has Fe atom ---hybridised with unpaired ----electrons
(A) d^2sp^3, 4 (B) d^2sp^3, 5 (C) sp^3d^2, 5 (D) sp^3d^2, 3

Q.67 Which of the following statements about $Fe(CO)_5$ is correct?
(A) It is paramagnetic and high spin complex (B) It is diamagnetic and high spin complex
(C) It is diamagnetic and low spin complex (D) It is paramagnetic and low spin complex

Q.68 Which of the following statements is not true?
(A) $MnCl_4^{2-}$ ion has tetrahedral geometry and is paramagnetic
(B) $[Mn(CN)_6]^{2-}$ ion has octahedral geometry and is paramagnetic
(C) $[CuCl_4]^{2-}$ has square planar goemetry and is paramagnetic
(D) $[Ni(Ph_3P)_2Br_3]$ has trigonal bipyramidal geometry and one unpaired electron

Q.69 The increasing order of magnetism of
(I) $MnSO_4.4H_2O$ (II) $FeSO_4.7H_2O$ (III) $NiSO_4.6H_2O$ (IV) $CuSO_4.5H_2O$
(A) I < II < III < IV (B) IV < III < II < I (C) III < IV < II < I (D) III < IV < I < II

Q.70 Which of the following statements is correct?
(A) Geometrical isomerism is not observed in complexes of C.N.4 having tetrahedral geometry
(B) Square planar complexes generally do not show geometrical isomerism
(C) The square planar complex of general formulae Ma_3b or Mab_3 exhibits cis–trans isomerism
(D) The platinum glycinato complex, $[Pt(Gly)_2]$ does not show geometrical isomerism

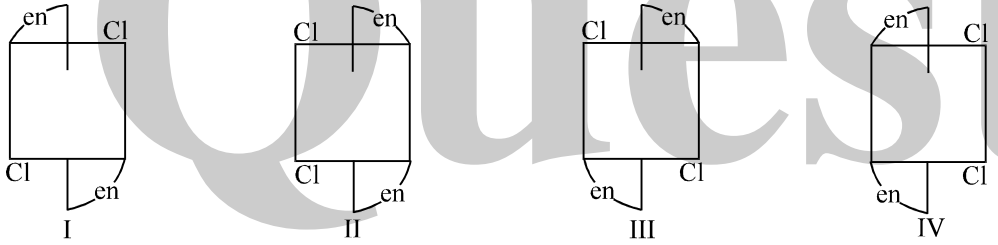
Q.71 Geometrical isomerism can be shown by
(A) $[Ag(NH_3)(CN)]$ (B) $Na_2[Cd(NO_2)_4]$ (C) $[PtCl_4I_2]$ (D) $[Pt(NH_3)_3Cl][Au(CN)_4]$

Q.72 $[Co(en)_3]^{3+}$ ion is expected to show
(A) two optically active isomers: d and *l* forms
(B) three optically active isomers: d, *l* and meso forms
(C) four optically active isomers: cis, d and *l* isomers and trans d and *l* isomers
(D) none of these

Q.73 The number of geometrical isomers for octahedral $[Co(NH_3)_2Cl_4]^-$, square planar $[AuCl_2Br_2]^-$ and $[Pt(en)Cl_2]$ are
(A) 2, 2, 2 (B) 2, 2, no isomerism (C) 3, 2, 2 (D) 2, 3, no isomerism

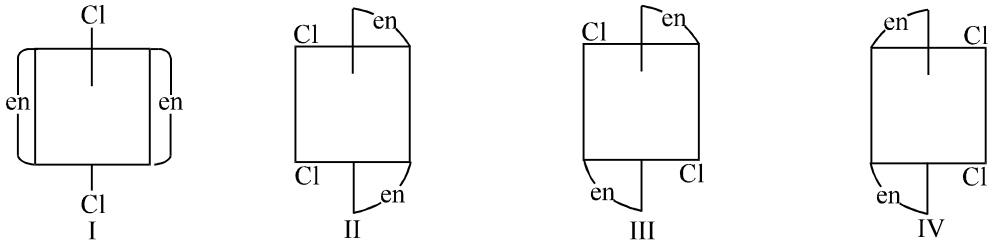
Q.74 Which of the following statements is not true about the complex ion $[Cr(en)_2Cl_2]^+$
(A) It has two geometrical isomers – cis and strans
(B) Both the cis and trans isomers display optical activity
(C) Only the cis isomer displays optical activity
(D) Only the cis isomer has non–superimpossible mirror image

Q.75 Of the following configurations, the optical isomers are



(A) I and II (B) I and III (C) II and IV (D) II and III

Q.76 Identify the geometrical isomers of the following:

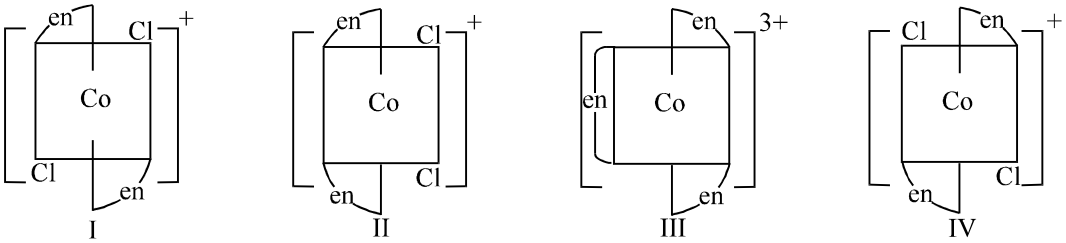


(A) I with III (B) II with IV (C) I with II and IV (D) none of these

Q.77 Other than the X–ray diffractions, how could be the following pairs of isomers be distinguished from one another by
$[Cr(NH_3)_6]$ $[Cr(NO_2)_6]$ and $[Cr(NH_3)_4(NO_2)_2]$ $[Cr(NH_3)_2(NO_2)_4]$
(A) electrolysis of an aqueous solution (B) measurement of molar conductance
(C) measuring magnetic moments (D) observing their colours

Q.78 How the isomeric complexes $[Co(NH_3)_6][Cr(NO_2)_6]$ and $[Cr(NH_3)_6][Co(NO_2)_6]$ can be distinguished from one another by
(A) conductivity measurement (B) measuring magnetic moments
(C) electrolysis of their aqueous solutions (D) optical measurement

Q.79 Which of the following ions are optically active?



(A) I only (B) II only (C) II and III (D) IV only

Q.80 Which of the following polymerisation isomers of the compound having empirical formula $Cr(NH_3)_3(NO_2)_3$ has the lowest molecular mass?
(A) $[Cr(NH_3)_4(NO_2)_2]^+ [Cr(NH_3)_2(NO_2)_4]^-$ (B) $[Cr(NH_3)_6]^{3+}[Cr(NO_2)_6]^{3-}$
(C) $[Cr(NH_3)_5(NO_2)]^{2+}[Cr(NH_3)(NO_2)_5]^{2-}$ (D) all

Q.81 Octahedral complex of Ni(II) must be
(A) inner orbital
(B) outer orbital
(C) inner or outer orbital depending upon the strong or weak field ligand
(D) none of these

Q.82 For the correct assignment of electronic configuration of a complex, the valence bond theory often requires the measurement of
(A) molar conductance (B) optical activity (C) magnetic moment (D) dipole moment

Q.83 Mn^{2+} forms a complex with Br^- ion. The magnetic moment of the complex is 5.92 B.M. What could not be the probable formula and geometry of the complex?
(A) $[MnBr_6]^{4-}$, octahedral (B) $[MnBr_4]^{2-}$, square planar
(C) $[MnBr_4]^{2-}$, tetrahedral (D) $[MnBr_5]^{3-}$, trigonal bipyramidal

Q.84 How many isomers are possible for the complex ion $[Cr(NH_3)(OH)_2Cl_3]^{2-}$
(A) 2 (B) 3 (C) 4 (D) 5

Q.85 A complex of certain metal has the magnetic moment of 4.91 BM whereas another complex of the same metal with same oxidation state has zero magnetic moment. The metal ion could be
(A) Co^{2+} (B) Mn^{2+} (C) Fe^{2+} (D) Fe^{3+}

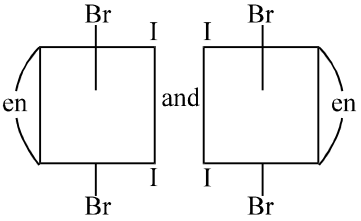
Q.86 The tetrahedral $[CoI_4]^{2-}$ and square planar $[PdBr_4]^{2-}$ complex ions are respectively
(A) low spin, high spin (B) high spin, low spin (C) both low spin (D) both high spin

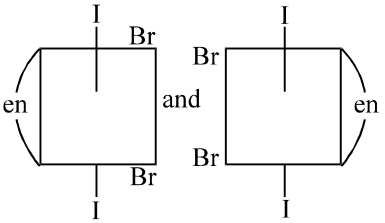
Q.87 Ethylenediaminetetraacetic acid (EDTA) is the antidote for lead poisoning. It is administered in the form of
(A) free acid (B) sodium dihydrogen salt
(C) Calcium dihydrogen salt (D) none of these

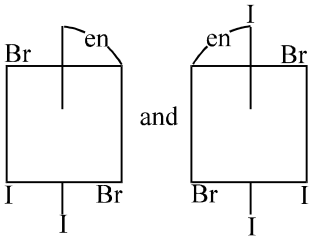
Q.88 The species having tetrahedral shape is
(A) $[PdCl_4]^{2-}$ (B) $[Ni(CN)_4]^{2-}$ (C) $[Pd(CN)_4]^{2-}$ (D) $[NiCl_4]^{2-}$

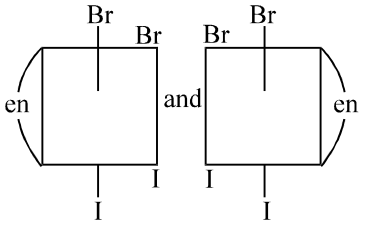
Q.89 Which one of the following species does not represent cationic species of vanadium formed in aqueous solution
(A) VO_2^+ (B) VO^{2+} (C) $[V(H_2O)_6]^{3+}$ (D) VO_2^{2+}

Q.90 The complex ion has two optical isomers. Their correct configurations are:

(A) 

(B) 

(C) 

(D) 

Q.91 The EAN of metal atoms in $Fe(NO)_2(CO)_2$ and $Co_2(CO)_8$ respectively are
(A) 34, 35 (B) 34, 36 (C) 36, 36 (D) 36, 35

Q.92 Following Sidgwick's rule of EAN, $Co(CO)_x$ will be
(A) $Co_2(CO)_4$ (B) $Co_2(CO)_3$ (C) $Co_2(CO)_8$ (D) $CO_2(CO)_{10}$

Q.93 On treatment of $[Ni(NH_3)_4]^{2+}$ with concentrated HCl, two compounds I and II having the same formula, $Ni(NH_3)_2Cl_2$ are obtained, I can be converted into II by boiling with dilute HCl. A solution of I reacts with oxalic acid to form $[Ni(NH_3)_2(C_2O_4)]$ wheras II does not react. Point out the correct statement of the following
(A) I cis, II trans; both tetrahedral (B) I cis, II trans; both square planar
(C) I trans, II cis; both tetrahedral (D) I trans, II cis; both square planar

Q.94 Coordination isomerism could be shown by
(A) $[Ag(NH_3)_2][CuCl_2]$ (B) $[Al(H_2O)_6][Co(CN)_6]$
(C) $[Fe(NH_3)_6]_2[Pt(CN)_6]_3$ (D) $[Co(NH_3)_5Cl]SO_4$

Q.95 Point out the correct statements amongst the following
(A) $[Cu(CN)_4]^{3-}$ has tetrahedral geometry and dsp^2 hybridization
(B) $[Ni(CN)_6]^{4-}$ is octahedral and Ni has d^2sp^3 hybridization
(C) $[ZnBr_4]^{2-}$ is tetrahedral and diamagnetic
(D) $[Cr(NH_3)_6]^{3+}$ has octahedral geometry and sp^3d^2 hybridization

Q.96 Among the following ions which one has the highest paramagnetism
(A) $[Cr(H_2O)_6]^{3+}$ (B) $[Fe(H_2O)_6]^{2+}$ (C) $[Cu(H_2O)_6]^{2+}$ (D) $[Zn((H_2O)_6]^{2+}$

Q.97 Among the following, the compound that is both paramagnetic and coloured is
(A) $K_2Cr_2O_7$ (B) $(NH_4)_2[TiCl_6]$ (C) $VOSO_4$ (D) $K_3[Cu(CN)_4]$

Q.98 Which of the following compounds is expected to be coloured
(A) Ag_2SO_4 (B) CuF_2 (C) MgF_2 (D) CuCl

Q.99 Which compound is formed when excess of KCN is added to aqueous solution of copper sulphate?
(A) $Cu(CN)_2$ (B) $K_2[Cu(CN)_4]$ (C) $K[Cu(CN)_2]$ (D) $K_3[Cu(CN)_4]$

Q.100 Which of the following complex shows ionization isomerism
(A) $[Cr(NH_3)_6]Cl_3$ (B) $[Cr(en)_2]Cl_2$ (C) $[Cr(en)_3]Cl_3$ (D) $[Co(NH_3)_5Br]SO_4$

ANSWER KEY

Q.1 D	Q.2 B	Q.3 C	Q.4 C
Q.5 D	Q.6 B	Q.7 B	Q.8 C
Q.9 B	Q.10 B	Q.11 B	Q.12 D
Q.13 A	Q.14 C	Q.15 C	Q.16 C
Q.17 C	Q.18 C	Q.19 B	Q.20 A
Q.21 C	Q.22 D	Q.23 D	Q.24 B
Q.25 C	Q.26 C	Q.27 A	Q.28 D
Q.29 B	Q.30 B	Q.31 D	Q.32 B
Q.33 B	Q.34 D	Q.35 A	Q.36 C
Q.37 C	Q.38 B	Q.39 B	Q.40 D
Q.41 B	Q.42 B	Q.43 C	Q.44 D
Q.45 C	Q.46 B	Q.47 C	Q.48 D
Q.49 B	Q.50 D	Q.51 B	Q.52 A
Q.53 C	Q.54 C	Q.55 D	Q.56 C
Q.57 B	Q.58 A	Q.59 D	Q.60 C
Q.61 C	Q.62 C	Q.63 D	Q.64 B
Q.65 D	Q.66 C	Q.67 C	Q.68 C
Q.69 B	Q.70 A	Q.71 C	Q.72 A
Q.73 B	Q.74 B	Q.75 C	Q.76 C
Q.77 B	Q.78 C	Q.79 C	Q.80 D
Q.81 B	Q.82 C	Q.83 B	Q.84 B
Q.85 C	Q.86 B	Q.87 C	Q.88 D
Q.89 D	Q.90 D	Q.91 C	Q.92 C
Q.93 B	Q.94 A, B	Q.95 C	Q.96 B
Q.97 C	Q.98 B	Q.99 D	Q.100 D

Power Coaching

QUEST TUTORIALS

TARGET IIT JEE

INORGANIC CHEMISTRY

d-BLOCK ELMENTS

d-BLOCK ELEMENTS

Select one or more than one correct options.

Q.1 (T) imparts violet colour $\xrightarrow{\text{compd (U) } + \text{conc.} H_2SO_4}$ (V)Red gas $\xrightarrow{NaOH + AgNO_3}$ (W)Red ppt. $\xrightarrow{NH_3 \text{ soln.}}$ (X)

(W) Red ppt. $\xrightarrow{\text{dil. HCl}}$ (Y) white ppt.

(U) $\xrightarrow[\Delta]{NaOH}$ (Z) gas (gives white fumes with HCl)

sublimes on heating

Identify (T) to (Z).

(A) T = $KMnO_4$, U = HCl, V = Cl_2, W = HgI_2, X = $Hg(NH_2)NO_3$, Y = Hg_2Cl_2, Z = N_2

(B) T=$K_2Cr_2O_7$, U=NH_4Cl, V=CrO_2Cl_2, W=Ag_2CrO_4, X=$[Ag(NH_3)_2]^+$, Y=AgCl,Z = NH_3

(C) T = K_2CrO_4, U = KCl, V = CrO_2Cl_2, W = HgI_2, X = Na_2CrO_4, Y = $BaCO_3$, Z = NH_4Cl

(D) T = K_2MnO_4, U = NaCl, V = CrO_3, W = $AgNO_2$, X = $(NH_4)_2CrO_4$, Y = $CaCO_3$, Z = SO_2

Q.2 The number of moles of acidified $KMnO_4$ required to convert one mole of sulphite ion into sulphate ion is
(A) 2/5 (B) 3/5 (C) 4/5 (D) 1

Q.3 $N_2(g) + 3H_2(g) \underset{}{\overset{\text{Fe + Mo}}{\rightleftharpoons}} 2NH_3(g)$; Haber's process, Mo is used as
(A) a catalyst (B) a catalytic promoter
(C) an oxidising agent (D) as a catalytic poison

Q.4 Potash alum is a double salt, its aqueous solution shows the characteristics of
(A) Al^{3+} ions (B) K^+ ions (C) SO_4^{2-} ions (D) Al^{3+} ions but not K^+ ions

Q.5 $Cr_2O_7^{2-} \underset{Y}{\overset{X}{\rightleftharpoons}} 2CrO_4^{2-}$, X and Y are respectively
(A) X = OH^-, Y = H^+ (B) X = H^+, Y = OH^-
(C) X = OH^-, Y = H_2O_2 (D) X = H_2O_2, Y = OH^-

Q.6 Addition of non-metals like B and C to the interstitial sites of a transition metal results the metal
(A) of more ductability (B) of less ductability (C) less malleable (D) of more hardness

Q.7 Mercury is a liquid at 0°C because of
(A) very high ionisation energy (B) weak metallic bonds
(C) high heat of hydration (D) high heat of sublimation

Q.8 CrO_3 dissolves in aqueous NaOH to give
(A) $Cr_2O_7^{2-}$ (B) CrO_4^{2-} (C) $Cr(OH)_3$ (D) $Cr(OH)_2$

Q.9 The correct statement(s) about transition elements is/are
(A) the most stable oxidation state is +3 and its stability decreases across the period
(B) transition elements of 3d-series have almost same atomic sizes from Cr to Cu
(C) the stability of +2 oxidation state increases across the period
(D) some transition elements like Ni, Fe, Cr may show zero oxidation state in some of their compounds

Q.10 An ornamental of gold having 75% of gold, it is of ..... carat.
(A) 18 (B) 16 (C) 24 (D) 20

Q.11 Solution of MnO_4^- is purple-coloured due to
(A) d-d-transition (B) charge transfer from O to Mn
(C) due to both d-d-transition and charge transfer (D) none of these

Q.12 The ionisation energies of transition elements are
(A) less than p-block elements (B) more than s-block elements
(C) less than s-block elements (D) more than p-block elements

Q.13 Transition elements are more metallic than representative elements (s and p-block elements) due to
(A) availability of d-orbitals for bonding
(B) variable oxidation states are not shown by transition elements
(C) all electrons are paired in d-orbitals
(D) *f*-orbitals are available for bonding

Q.14 During estimation of oxalic acid Vs $KMnO_4$, self indicator is
(A) $KMnO_4$ (B) oxalic acid (C) K_2SO_4 (D) $MnSO_4$

Q.15 The metal(s) which does/do not form amalgam is/are
(A) Fe (B) Pt (C) Zn (D) Ag

Q.16 Which of the following statements concern with transition metals?
(A) compounds containing ions of transition elements are usually coloured
(B) the most common oxidation state is +3
(C) they show variable oxidation states, which differ by two units only
(D) they easily form complexes

Q.17 Correct statement(s) is/are
(A) an acidified solution of $K_2Cr_2O_7$ liberates iodine from KI
(B) $K_2Cr_2O_7$ is used as a standard solution for estimation of Fe^{2+} ions
(C) in acidic medium, M = N/6 for $K_2Cr_2O_7$
(D) $(NH_4)_2Cr_2O_7$ on heating decomposes to yield Cr_2O_3 through an endothermic reaction

Q.18 The highest oxidation state shown by transition elements is
(A) + 7 by Mn (B) + 8 by Os (C) + 8 by Ru (D) + 7 by Fe

Q.19 A compound of mercury used in cosmetics, in Ayurvedic and Yunani medicines and known as Vermilon is
(A) $HgCl_2$ (B) HgS (C) Hg_2Cl_2 (D) HgI

Q.20 Acidified chromic acid + $H_2O_2 \xrightarrow[\text{(blue colour)}]{\text{Org.solvent}} X + Y$, X and Y are
(A) CrO_5 and H_2O (B) Cr_2O_3 and H_2O (C) CrO_2 and H_2O (D) CrO and H_2O

Q.21 $\uparrow Y(g) \xleftarrow{KI} CuSO_4 \xrightarrow{dil\,H_2SO_4} X(Blue\,colour)$, X and Y are
(A) $X = I_2$, $Y = [Cu(H_2O)_4]^{2+}$ (B) $X = [Cu(H_2O)_4]^{2+}$, $Y = I_2$
(C) $X = [Cu(H_2O)_4]^{+}$, $Y = I_2$ (D) $X = [Cu(H_2O)_5]^{2+}$, $Y = I_2$

Q.22 Transition elements are usually characterised by variable oxidation states but Zn does not show this property because of
(A) completion of np-orbitals (B) completion of (n–1)d orbitals
(C) completion of ns-orbitals (D) inert pair effect

Q.23 $(NH_4)_2Cr_2O_7$ (Ammonium dichromate) is used in fire works. The green coloured powder blown in air is
(A) Cr_2O_3 (B) CrO_2 (C) Cr_2O_4 (D) CrO_3

Q.24 The d-block element which is a liquid at room temperature, having high specific heat, less reactivity than hydrogen and its chloride (MX_2) is volatile on heating is
(A) Cu (B) Hg (C) Ce (D) Pm

Q.25 Coinage metals show the properties of
(A) typical elements (B) normal elements
(C) inner-transition elements (D) transition element

Q.26 Iron becomes passive by ..... due to formation of .....
(A) dil. HCl, Fe_2O_3 (B) 80% conc. HNO_3, Fe_3O_4
(C) conc. H_2SO_4, Fe_3O_4 (D) conc. HCl, Fe_3O_4

Q.27 Bayer's reagent used to detect olifinic double bond is
(A) acidified $KMnO_4$ (B) aqueous $KMnO_4$
(C) 1% alkaline $KMnO_4$ solution (D) $KMnO_4$ in benzene

Q.28 Amphoteric oxide(s) is/are
(A) Al_2O_3 (B) SnO (C) ZnO (D) Fe_2O_3

Q.29 Interstitial compounds are formed by
(A) Co (B) Ni (C) Fe (D) Ca

Q.30 The transition metal used in X-rays tube is
(A) Mo (B) Ta (C) Tc (D) Pm

Q.31 The catalytic activity of transition elements is related to their
(A) variable oxidation states (B) surface area
(C) complex formation ability (D) magnetic moment

Q.32 $MnO_4^- \xrightarrow[(\text{Alkaline medium})]{+ xe^-} MnO_4^{2-}$
$\xrightarrow{+ ye^- (\text{Acidic medium})} Mn^{2+}$
$\xrightarrow{+ ze^- (\text{Neutral medium})} MnO_2$
x, y and z are respectively
(A) 1, 2, 3 (B) 1, 5, 3 (C) 1, 3, 5 (D) 5, 3, 1

Q.33 $Cu + \text{conc. } HNO_3 \xrightarrow[(\text{hot})]{} Cu(NO_3)_2 + X$ (oxide of nitrogen); then X is
(A) N_2O (B) NO_2 (C) NO (D) N_2O_3

Q.34 When $KMnO_4$ solution is added to hot oxalic acid solution, the decolourisation is slow in the beginning but becomes instantaneous after some time. This is because
(A) Mn^{2+} acts as auto catalyst (B) CO_2 is formed
(C) Reaction is exothermic (D) MnO_4^- catalyses the reaction.

Q.35 $CuSO_4$ solution reacts with excess KCN to give
(A) $Cu(CN)_2$ (B) CuCN (C) $K_2[Cu(CN)_2]$ (D) $K_3[Cu(CN)_4]$

Q.36 The higher oxidation states of transition elements are found to be in the combination with A and B, which are
(A) F, O (B) O, N (C) O, Cl (D) F, Cl

Q.37 In the equation: $M + 8CN^- + 2H_2O + O_2 \longrightarrow 4[M(CN)_2]^- + 4OH^-$, metal M is
(A) Ag (B) Au (C) Cu (D) Hg

Q.38 An element of 3d-transition series shows two oxidation states x and y, differ by two units then
(A) compounds in oxidation state x are ionic if $x > y$
(B) compounds in oxidation state x are ionic if $x < y$
(C) compounds in oxidation state y are covalent if $x < y$
(D) compounds in oxidation state y are covalent if $y < x$

Q.39 Pick out the incorrect statement:
(A) MnO_2 dissolves in conc. HCl, but does not form Mn^{4+} ions
(B) MnO_2 oxidizes hot concentrated H_2SO_4 liberating oxygen
(C) K_2MnO_4 is formed when MnO_2 in fused KOH is oxidised by air, KNO_3 , PbO_2 or $NaBiO_3$
(D) Decomposition of acidic $KMnO_4$ is not catalysed by sunlight.

Q.40 1 mole of Fe^{2+} ions are oxidised to Fe^{3+} ions with the help of (in acidic medium)
(A) 1/5 moles of $KMnO_4$ (B) 5/3 moles of $KMnO_4$
(C) 2/5 moles of $KMnO_4$ (D) 5/2 moles of $KMnO_4$

Q.41 The metals present in insulin and haemoglobin are respectively
(A) Zn, Hg (B) Zn, Fe (C) Co, Fe (D) Mg, Fe

Q.42 To an acidified dichromate solution, a pinch of Na_2O_2 is added and shaken. What is observed:
(A) blue colour
(B) Red colour changing to green
(C) Copious evolution of oxygen
(D) Bluish - green precipitate

Q.43 The rusting of iron is formulated as $Fe_2O_3 \cdot xH_2O$ which involves the formation of
(A) Fe_2O_3 (B) $Fe(OH)_3$ (C) $Fe(OH)_2$ (D) $Fe_2O_3 + Fe(OH)_3$

Q.44 Metre scales are made-up of alloy
(A) invar (B) stainless steel (C) elektron (D) magnalium

Q.45 Amongst CuF_2, $CuCl_2$ and $CuBr_2$
(A) only CuF_2 is ionic
(B) both $CuCl_2$ and $CuBr_2$ are covalent
(C) CuF_2 and $CuCl_2$ are ionic but $CuBr_2$ is covalent
(D) CuF_2, $CuCl_2$ as well as $CuBr_2$ are ionic

Q.46 A metal M which is not affected by strong acids like conc. HNO_3, conc. H_2SO_4 and conc. solution of alkalies like NaOH, KOH forms MCl_3 which finds use for toning in photography. The metal M is
(A) Ag (B) Hg (C) Au (D) Cu

Q.47 Solid $CuSO_4 \cdot 5H_2O$ having covalent, ionic as well as co-ordinate bonds. Copper atom/ion forms ..... co-ordinate bonds with water.
(A) 1 (B) 2 (C) 3 (D) 4

Q.48 $CuSO_4(aq) + 4NH_3 \longrightarrow X$, then X is
(A) $[Cu(NH_3)_4]^{2+}$
(B) paramagnetic
(C) coloured
(D) of a magnetic moment of 1.73 BM

Q.49 $KMnO_4 + HCl \longrightarrow H_2O + X(g)$, X is a
(acidified)
(A) red liquid (B) violet gas (C) greenish yellow gas (D) yellow-brown gas

Q.50 Purple of cassius is:
(A) Pure gold
(B) Colliodal solution of gold
(C) Gold (I) hydroxide
(D) Gold (III) chloride

Q.51 Amongst the following species, maximum covalent character is exhibited by
(A) $FeCl_2$ (B) $ZnCl_2$ (C) $HgCl_2$ (D) $CdCl_2$

Q.52 Number of moles of $SnCl_2$ required for the reduction of 1 mole of $K_2Cr_2O_7$ into Cr_2O_3 is (in acidic medium)
(A) 3 (B) 2 (C) 1 (D) 1/3

Q.53 Amphoteric oxide(s) of Mn is/are
(A) MnO_2 (B) Mn_3O_4 (C) Mn_2O_7 (D) MnO

Q.54 Pick out the incorrect statement:

(A) MnO_4^{2-} is quite strongly oxidizing and stable only in very strong alkalies. In dilute alkali, neutral solutions, it disproportionates.

(B) In acidic solutions, MnO_4^- is reduced to Mn^{2+} and thus, $KMnO_4$ is widely used as oxidising agent

(C) $KMnO_4$ does not acts as oxidising agent in alkaline medium
(D) $KMnO_4$ is manufactured by the fusion of pyrolusite ore with KOH in presence of air or KNO_3, followed by electrolytic oxidation in alkaline solution.

Q.55 The aqueous solution of $CuCrO_4$ is green because it contains
(A) green Cu^{2+} ions
(B) green CrO_4^{2-} ions
(C) blue Cu^{2+} ions and green CrO_4^{2-} ions
(D) blue Cu^{2+} ions and yellow CrO_4^{2-} ions

Q.56 Manganese steel is used for making railway tracks because
(A) it is hard with high percentage of Mn
(B) it is soft with high percentage of Mn
(C) it is hard with small concentration of manganese with impurities
(D) it is soft with small concentration of manganese with impurities

Q.57 In nitroprusside ion, the iron exists as Fe^{2+} and NO as NO^+ rather than Fe^{3+} and NO respectively. These forms of ions are established with the help of
(A) magnetic moment in solid state (B) thermal decomposition method
(C) by reaction with KCN (D) by action with K_2SO_4

Q.58 Acidified $KMnO_4$ can be decolourised by
(A) SO_2 (B) H_2O_2 (C) $FeSO_4$ (D) $FeCl_3$

Q.59 Transition elements in lower oxidation states act as Lewis acid because
(A) they form complexes (B) they are oxidising agents
(C) they donate electrons (D) they do not show catalytic properties

Q.60 The lanthanide contraction is responsible for the fact that
(A) Zr and H*f* have same atomic sizes (B) Zr and H*f* have same properties
(C) Zr and H*f* have different atomic sizes (D) Zr and H*f* have different properties

Q.61 The Ziegler-Natta catalyst used for polymerisation of ethene and styrene is $TiCl_4 + (C_2H_5)_3Al$, the catalysing species (active species) involved in the polymerisation is
(A) $TiCl_4$ (B) $TiCl_3$ (C) $TiCl_2$ (D) TiCl

Q.62 An ion of definite magnetic moment (spin only) is
(A) Sc^{3+} (B) Ti^{3+} (C) Cu^{2+} (D) Zn^{2+}

Q.63 The electrons which take part in order to exhibit variable oxidation states by transition metals are
(A) ns only (B) (n–1)d only
(C) ns and (n–1)d only but not np (D) (n–1)d and np only but not ns

Q.64 'Bordeaux mixture' is used as a fungicide. It is a mixture of
(A) $CaSO_4 + Cu(OH)_2$ (B) $CuSO_4 + Ca(OH)_2$
(C) $CuSO_4 + CaO$ (D) $CuO + CaO$

Q.65 Which of the following reaction is possible at anode?
(A) $2Cr^{3+} + 7H_2O \longrightarrow Cr_2O_7^{2-} + 14\ H^+$ (B) $F_2 \longrightarrow 2\ F^-$
(C) $\frac{1}{2}O_2 + 2H^+ \longrightarrow H_2O$ (D) None of these

Q.66 Colourless solutions of the following four salts are placed separately in four different test tubes and a strip of copper is dipped in each one of these. Which solution will turn blue?
(A) KNO_3 (B) $AgNO_3$ (C) $Zn(NO_3)_2$ (D) $ZnSO_4$

Q.67 Peacock ore is:
(A) FeS_2 (B) $CuFeS_2$ (C) $CuCO_3.Cu(OH)_2$ (D) Cu_5FeS_4

Q.68 "925 fine silver" means an alloy of:
(A) 7.5 % Ag and 92.5% Cu (B) 92.5 % Ag and 7.5 % Cu
(C) 80% Ag and 20 % Cu (D) 90 % Ag and 10% Cu

Q.69 Iron salt used in blue prints is:
(A) FeC_2O_4 (B) $Fe_2(C_2O_4)_3$ (C) $K_4[Fe(CN)_6]$ (D) $K_3[Fe(CN)_6]$

Q.70 When acidified $KMnO_4$ is added to hot oxalic acid solution, the decolourization is slow in the beginning, but becomes very rapid after some time. This is because:
(A) Mn^{2+} acts as autocatalyst (B) CO_2 is formed as the product
(C) Reaction is exothermic (D) MnO_4^- catalyses the reaction

Question No. 71 to 80

Questions given below consist of two statements each printed as Assertion (A) and Reason (R); while answering these questions you are required to choose any one of the following four responses:

(A) if both (A) and (R) are true and (R) is the correct explanation of (A)

(B) if both (A) and (R) are true but (R) is not correct explanation of (A)

(C) if (A) is true but (R) is false

(D) if (A) is false and (R) is true

Q.71 **Assertion** : $KMnO_4$ is purple in colour due to charge transfer.

Reason : In MnO_4^-, there is no electron present in d-orbitals of manganese.

Q.72 **Assertion** : K_2CrO_4 has yellow colour due to charge transfer.

Reason : CrO_4^{2-} ion is tetrahedral in shape.

Q.73 **Assertion** : The highest oxidation state of chromium in its compounds is +6.

Reason : Chromium atom has only six electrons in ns and (n–1) d orbitals.

Q.74 **Assertion** : CrO_3 reacts with HCl to form chromyl chloride gas.

Reason : Chromyl chloride (CrO_2Cl_2) has tetrahedral shape.

Q.75 **Assertion** : Zinc does not show characteristic properties of transition metals.

Reason : In zinc outermost shell is completely filled.

Q.76 **Assertion** : Tungsten has a very high melting point.

Reason : Tungsten is a covalent compound.

Q.77 **Assertion** : Equivalent mass of $KMnO_4$ is equal to one-third of its molecular mass when it acts as an oxidising agent in an alkaline medium.

Reason : Oxidation number of Mn is +7 in $KMnO_4$.

Q.78 **Assertion** : Ce^{4+} is used as an oxidising agent in volumetric analysis.

Reason : Ce^{4+} has the tendency of attain +3 oxidation state.

Q.79 **Assertion** : Promethium is a man made element.

Reason : It is radioactive and has been prepared by artifical means.

Q.80 **Assertion** : Cu^+ ion is colourless.

Reason : Four water molecules are coordinated to Cu^+ ion.

ANSWER KEY

Q.1	B	Q.2	A	Q.3	B	Q.4	A,B,C	Q.5	A
Q.6	B,C,D	Q.7	A,B	Q.8	B	Q.9	A,B,C,D	Q.10	A
Q.11	B	Q.12	A,B	Q.13	A	Q.14	A	Q.15	A,B
Q.16	A,B,D	Q.17	A,B,C	Q.18	B,C	Q.19	B	Q.20	A
Q.21	B	Q.22	B	Q.23	A	Q.24	B	Q.25	D
Q.26	B	Q.27	C	Q.28	A,B,C	Q.29	A,B,C	Q.30	A
Q.31	A,B,C	Q.32	B	Q.33	B	Q.34	A	Q.35	D
Q.36	A	Q.37	A,B	Q.38	B,C	Q.39	D	Q.40	A
Q.41	B	Q.42	A,C	Q.43	D	Q.44	A	Q.45	A,B
Q.46	C	Q.47	D	Q.48	A,B,C,D	Q.49	C	Q.50	B
Q.51	C	Q.52	A	Q.53	A,B	Q.54	C	Q.55	D
Q.56	A	Q.57	A	Q.58	A,B,C	Q.59	A	Q.60	A,B
Q.61	B	Q.62	B,C	Q.63	C	Q.64	B	Q.65	A
Q.66	B	Q.67	D	Q.68	B	Q.69	B	Q.70	A
Q.71	B	Q.72	B	Q.73	A	Q.74	B	Q.75	C
Q.76	C	Q.77	B	Q.78	A	Q.79	A	Q.80	C

Power Coaching

QUEST TUTORIALS

TARGET IIT JEE

INORGANIC CHEMISTRY

METALLURGY

ONLY ONE OPTION IS CORRECT.

Q.1 Formation of metallic copper from the sulphide ore in the normal thermo-metallurgical process essentially involves which one of the following reaction:

(A) $CuS + \frac{3}{2}O_2 \longrightarrow CuO + SO_2$; $CuO + C \longrightarrow Cu + CO$

(B) $CuS + \frac{3}{2}O_2 \longrightarrow CuO + SO_2$; $2CuO + CuS \longrightarrow 3Cu + SO_2$

(C) $CuS + 2O_2 \longrightarrow CuSO_4$; $CuSO_4 + CuS \longrightarrow 2Cu + 2SO_2$

(D) $CuS + \frac{3}{2}O_2 \longrightarrow CuO + SO_2$; $CuO + CO \longrightarrow Cu + CO_2$

Q.2 $Ag_2S + NaCN + Zn \longrightarrow Ag$

This method of extraction of Ag by complex formation and then its displacement is called:

(A) Parke's method (B) McArthur-Forest method

(C) Serpeck method (D) Hall's method

Q.3 Calcination is the process of heating the ore:

(A) in inert gas (B) in the presence of air

(C) in the absence of air (D) in the presence of CaO and MgO

Q.4 Which of the following does not contain Mg:

(A) magnetite (B) magnesite (C) asbestos (D) carnallite

Q.5 Match the method of concentration of the ore in column I with the ore in column II and select the correct alternate:

	I		**II**
X	magnetic separation	(a)	Ag_2S
Y	froth floation	(b)	$FeCr_2O_4$
Z	gravity separation	(c)	$Al_2(SiO_3)_3$

	X	**Y**	**Z**		**X**	**Y**	**Z**
(A)	(a)	(b)	(c)	(B)	(b)	(a)	(c)
(C)	(c)	(a)	(b)	(D)	(b)	(c)	(a)

Q.6 Bessemerisation is carried out for

I : Fe, II : Cu, III : Al, IV : silver

(A) I , II (B) II, III (C) III, IV (D) I, III

Q.7 Refining of silver is done by:

(A) liquation (B) poling (C) cupellation (D) van Arkel method

Q.8 These are following extraction process of silver but not:

(A) as a side product in electrolytic refining of copper

(B) Parke's process in which Zn is used to extract silver by solvent extraction from molten lead

(C) by reaction of silver sulphide with KCN and then reaction of soluble complex with Zn

(D) by heating $Na[Ag(CN)_2]$

Q.9 Blister Cu is about:

(A) 60% Cu (B) 90% Cu (C) 98% Cu (D) 100% Cu

Q.10 Which one of the following is not a method of concentration of metals?

(A) gravity separation (B) froth floating process

(C) electromagnetic separation (D) smelting

Q.11 In which of the following isolations no reducing agent is required:

(A) iron from haematite (B) aluminium from bauxite

(C) mercury from cinnabar (D) zinc from zinc blende

Q.12 Chemical leaching is useful in the concentration of:
(A) copper pyrites (B) bauxite (C) galena (D) cassiterite

Q.13 The element which could be extracted by electrolytic reduction of its oxide dissolved in a high temperature melt is:
(A) sodium (B) magnesium (C) fluorine (D) aluminium

Q.14 Consider the following statements:
Roasting is carried out to :
(i) convert sulphide to oxide and sulphate
(ii) remove water of hydration
(iii) melt the ore
(iv) remove arsenic and sulphur impurities
Of these statements:
(A) (i), (ii) and (iii) are correct (B) (i) and (iv) are correct
(C) (i), (ii) and (iv) are correct (D) (ii), (iii) and (iv) are correct

Q.15 Iron obtained from blast furance is:
(A) wrought iron (B) cast iron (C) pig iron (D) steel

Q.16 Which of the following is not an ore:
(A) malacite (B) calamine (C) stellite (D) cerussite

Q.17 Which one of the following statements is not correct:
(A) Nickel forms $Ni(CO)_4$
(B) All the transition metals form monometallic carbonyls
(C) Carbonyls are formed by transition metals
(D) Transition metals form complexes

Q.18 In the extraction of nickel by Mond process, the metal is obtained by:
(A) electrochemical reduction (B) thermal decomposition
(C) chemical reduction by aluminium (D) reduction by carbon

Q.19 B_4C (boron carbide) is used except:
(A) to extract boron (B) as an abrasive for polishing
(C) for making bullet-proof clothing (D) for making diborane

Q.20 Boron can be obtained by various methods but not by:
(A) thermal decomposition of B_2H_6 (B) pyrolysis of Bl_3 (Van Arkel)
(C) reducing BCl_3 with H_2 (D) electrolysis of fused BCl_3

Q.21 The correct statements are :
(A) generally the calcination and roasting is done in blast furance
(B) the sandy and rocky materials associated with ore are called matrix
(C) froth floatation process is suitable for sulphide ores
(D) substance that reacts with gangue to form fusible mass is called slag

Q.22 When copper is purified by electrorefining process, noble metals like Ag and Au are found in
(A) cathode mud (B) electrolytic solution (C) anode mud (D) over cathode or anode

Q.23 Formation of $Ni(CO)_4$ and subsequent its decomposition into Ni and CO (recycled) makes basis of Mond's process

$$Ni + 4CO \xrightarrow{T_1} Ni(CO)_4 \xrightarrow{T_2} Ni + 4CO$$

T_1 and T_2 are:
(A) 100°C, 50°C (B) 50°C, 100°C (C) 50°C, 230°C (D) 230°C, 50°C

Q.24 Match column (I) (process) with column (II) (electrolyte)

	(I) (process)		(II) (electrolyte)
(i)	Downs cell	(W)	fused $MgCl_2$
(ii)	Dow sea water process	(X)	fused ($Al_2O_3 + Na_3AlF_6$)
(iii)	Hall-Heroult	(Y)	fused KHF_2
(iv)	Moissan	(Z)	fused (40% NaCl + 60% $CaCl_2$)

Choose the correct alternate:

	(i)	(ii)	(iii)	(iv)		(i)	(ii)	(iii)	(iv)
(A)	Z	W	X	Y	(B)	X	Y	Z	W
(C)	W	Z	X	Y	(D)	X	Z	W	Y

Question No. 25 to 28 are based on following reactions:

(I) $FeCr_2O_4 + NaOH + air \longrightarrow (A) + Fe_2O_3$

(II) $(A) + (B) \longrightarrow Na_2Cr_2O_7$

(III) $Na_2Cr_2O_7 + X \xrightarrow{\Delta} Cr_2O_3$

(IV) $Cr_2O_3 + Y \xrightarrow{\Delta} Cr$

Q.25 Compounds (A) and (B) are:

(A) Na_2CrO_4, H_2SO_4 (B) $Na_2Cr_2O_7$, HCl

(C) Na_2CrO_5, H_2SO_4 (D) $Na_4[Fe(OH)_6]$, H_2SO_4

Q.26 (X) and (Y) are:

(A) C and Al (B) Al and C (C) C in both (D) Al in both

Q.27 Na_2CrO_4 and Fe_2O_3 are separated by

(A) dissolving in conc. H_2SO_4 (B) dissolving in NH_3

(C) dissolving in H_2O (D) dissolving in dil. HCl

Q.28 High temperature (> 1000°C) electrolytic reduction is necessary for isolating

(A) Al (B) Cu (C) C (D) F_2

Q.29 In froth-floatation process, palm oil functions as

(A) activator (B) frother (C) collector (D) agitator

Q.30 Collectors are the substances which help in attachment of an ore particle to air bubble in froth. A popular collector used industrially is

(A) sodium ethyl xanthate (B) sodium xenate

(C) sodium pyrophosphate (D) sodium nitroprusside

Q.31 Zone refining is based on the principle of

(A) fractional distillation (B) fractional crystallisation

(C) partition coefficient (D) chromatographic separation

Q.32 Which of the following species is (are) desirable substance(s) in extraction of copper but not in extraction of iron?

(A) $CaSiO_3$ (B) $FeSiO_3$ (C) SiO_2 (D) coke

Q.33 Poling is employed in refining of

(A) iron (B) copper (C) tin (D) lead

Q.34 Which of the following reaction(s) do(es) not occur in Bessemer's converter?

(A) $2Cu_2S + 5O_2 \longrightarrow 2CuSO_4 + 2CuO$ (B) $2Cu_2S + 3O_2 \longrightarrow 2Cu_2O + 2SO_2\uparrow$

(C) $2CuFeS_2 + O_2 \longrightarrow Cu_2S + 2FeS + SO_2$ (D) $FeO + SiO_2 \longrightarrow FeSiO_3$

Q.35 Dow's process

(A) involves purification of copper (B) involves extraction of magnesium

(C) gives metal chloride as product (D) gives pure metal as product

(E) results in evolution of CO

Q.36 In the cyanide process involving extraction of silver, zinc is used industrially as a(an)
(A) oxidising agent (B) reducing agent (C) solvent (D) solvating agent

Q.37 Carnallite does not contain
(A) K (B) Ca (C) Mg (D) Cl

Q.38 During initial treatment, preferential wetting of ore by oil and gangue by water takes place in
(A) Levigation (gravity separation) (B) Froth floatation
(C) Leaching (D) Bessemerisation

Q.39 Silica is added to roasted copper ores during extraction in order to remove
(A) cuprous sulphide (B) ferrous oxide (C) ferrous sulphide (D) cuprous oxide

Q.40 Addition of high proportions of manganese makes steel useful in making rails of railroads, because manganese
(A) gives hardness to steel (B) helps the formation of oxides of iron
(C) can remove oxygen and sulphur (D) can show highest oxidation state of +7

Q.41 Among the following statements, the incorrect one is
(A) calamine and siderite are carbonates (B) argentite and cuprite are oxide
(C) zinc blende and pyrites are sulphides (D) malachite and azurite are ores of copper

Q.42 In the commercial electrochemical process for aluminium extraction the electrolyte used is
(A) $Al(OH)_3$ in NaOH solution (B) an aqueous solution of $Al_2(SO_4)_3$
(C) a molten mixture of Al_2O_3 ,Na_3AlF_6 & CaF_2 (D) a molten mixture of AlO(OH) and $Al(OH)_3$

Q.43 Match List-I with List-II and select the correct answer using the codes given below the lists:

List-I	**List-II**
(a) van Arkel method	1. Manufacture of caustic soda
(b) Solvay process	2. Purification of titanium
(c) Cupellation	3. Manufacture of Na_2CO_3
(d) Poling	4. Purification of copper
	5. Refining of silver

Codes:

	A	**B**	**C**	**D**		**A**	**B**	**C**	**D**
(A)	2	1	3	4	(B)	4	3	2	5
(C)	2	3	5	4	(D)	5	1	3	4

Q.44 Blister copper is refined by stirring molten impure metal with green logs of wood because such a wood liberates hydrocarbon gases (like CH_4). This process X is called _____ and the metal contains impurities of Y is _____.
(A) X = cupellation, Y = CuO_2 (B) X = polling, Y = Cu_2O
(C) X = polling, Y = CuO (D) X = cupellation, Y = CuO

Q.45 Select the correct statement :
(A) Magnetite is an ore of manganese (B) Pyrolusite is an ore of lead
(C) Siderite is carbonate ore of iron (D) FeS_2 is rolled gold

Q.46 Three most occuring elements into the earth crust are
(A) O, Si, Al (B) Si, O, Fe (C) Fe, Ca, Al (D) Si, O, N

Q.47 An ore containing the impurity of $FeCrO_4$ is concentrated by
(A) magnetic-separation (B) gravity separation
(C) froth-floatation method (D) electrostatic method

Q.48 A piece of steel is heated until redness and then plugged into cold water or oil. This treatment of iron makes it
(A) soft and malleable (B) hard but not brittle (C) more brittle (D) hard and brittle

Q.49 Give the correct order of initials **T** or **F** for following statements. Use **T** if statement is true and **F** if it is false.
(i) Cu metal is extracted from its sulphide ore by reduction of Cu_2O with FeS.
(ii) An ore of Tin containing $FeCrO_4$ is concentrated by magnetic separation method.
(iii) Auto reduction process is used in the extraction of Cu & Hg.
(iv) Cassiterite and Rutile are oxide ores of the metals.
(A) TFTT (B) TTFT (C) FTTT (D) FFFT

Q.50 In the extraction of aluminium
Process X : applied for red bauxite to remove iron oxide (chief impurity)
Process Y : (Serpeck's process) : applied for white bauxite to remove Z (chief impurity) then, process X and impurity Z are
(A) X = Hall and Heroult's process and Y = SiO_2
(B) X = Baeyer's process and Y = SiO_2
(C) X = Serpeck's process and Y = iron oxide
(D) X = Baeyer's process and Y = iron oxide

Q.51 Which of the following statement(s) is / are incorrect?
(A) Liquation is applied when the metal has low melting point than that of impurities.
(B) Presence of carbon in steel makes it hard due to formation of Fe_3C called cementite.
(C) Less reactive metals like Hg, Pb and Cu are obtained by auto reduction of their sulphide or oxide ores.
(D) Amalgamation method of purification cannot be applied for Au and Ag.

Q.52 Si and Ge used for semiconductors are required to be of high purity and hence purified by
(A) zone-refining (B) electrorefining
(C) Van-Arkel's process (D) cupellation process

Q.53 In electrorefining of metals anode and cathode are taken as thick slab of impure metal and a strip of pure-metal respectively while the electrolyte is solution of a complex metal salt. This method cannot be applied for the refining of
(A) Copper (B) Sodium (C) Aluminium (D) Zinc and Silver

Q.54 Correct statements is:
(A) Black jack is ZnS
(B) Sulphide ores are concentrated by floatation method
(C) Parke's process is based on distribution principle
(D) All are correct

Q.55 The metal for which, its property of formation of volatile complex is taken in account for its extraction is
(A) Cobalt (B) Nickel (C) Vanadium (D) Iron

Q.56 Match List–I with List–II

List–I (Property)		**List–II (Element/compound)**	
I	Explosive	A:	Cu
II	Self-reduction	B:	Fe_3O_4
III	Magnetic material	C:	$Cu(CH_3COO)_2.Cu(OH)_2$
IV	Verdigris	D:	$Pb(NO_3)_2$

(A) I–A, II–B, III–C, IV-D (B) I–D, II–A, III–B, IV–C
(C) I–D, II–B, III–A, IV–C (D) I–C, II–A, III–B, IV–D

Q.57 A metal has a high concentration into the earth crust and whose oxides cannot be reduced by carbon. The most suitable method for the extraction of such metal is
(A) Alumino thermite process (B) Electrolysis process
(C) Van-Arkel's process (D) Cupellation

Q.58 The process, which does not use a catalyst is
(A) Contact process (B) Thermite process (C) Ostwald's process (D) Haber's process

Q.59 Refractory materials are generally used in furnaces because
(A) they are chemically inert (B) they can withstand high temperature
(C) they do not contain impurities (D) they decrease melting point of ore

Q.60 % of silver in 'german silver' is
(A) 0 (B) 80 (C) 90 (D) 10

Q.61 Modern method of steel manufacturing is
(A) open hearth process (B) L.D. Process (C) Bessemerisation (D) Cupellation

Q.62 When an impurity in a metal has greater affinity for oxygen and is more easily oxidises than the metal itself. Then, the metal is refined by
(A) cupellation (B) zone-refining (C) distillation (D) electrolytic process

Q.63 The chemical process of manufacturing of steel from its ore haematite involves
(A) oxidation (B) reduction followed by oxidation
(C) oxidation followed by reduction (D) oxidation followed by decomposition and reduction

Q.64 "Fool's gold" is
(A) iron pyrites (B) horn silver (C) copper pyrites (D) bronze

Q.65 During electrolytic reduction of alumina, two auxiliary electrolytes X and Y are added to increase the electrical conductance and lower the temperature of melt in order to making fused mixture very conducting. X and Y are
(A) cryolite and flourspar (B) cryolite and alum (C) alum and flourspar (D) flourspar and bauxite

Q.66 For extraction of sodium from NaCl, the electrolytic mixture $NaCl + Na_3AlF_6 + CaCl_2$ is used. During extraction process, only sodium is deposited on cathode but K and Ca do not because
(A) Na is more reactive than K and Ca
(B) Na is less reactive than K and Ca
(C) NaCl is less stable than Na_3AlF_6 and $CaCl_2$
(D) the discharge potential of Na^+ is less than that of K^+ and Ca^{2+} ions.

Q.67 A solution of Na_2SO_4 in water is electrolysed using inert electrodes. The products at cathode and anode are respectively
(A) O_2 ; H_2 (B) O_2 ; Na (C) H_2 ; O_2 (D) O_2 ; SO_2

Q.68 Which of the following statements is correct regarding the slag formation during the extraction of a metal like copper or iron.
(A) The slag is lighter and lower melting than the metal
(B) The slag is heavier and lower melting than the metal
(C) The slag is lighter and higher melting than the metal
(D) The slag is heavier and higher melting than the metal.

Q.69 Among the following groups of oxides, the group containing oxides that cannot be reduced by C to give the respective metal is
(A) CaO and K_2O (B) Fe_2O_3 and ZnO (C) Cu_2O and SnO_2 (D) PbO and Pb_3O_4

Q.70 The beneficiation of the sulphide ores is usually done by
(A) Electrolysis (B) Smelting process
(C) Metal displacement method (D) Froth flotation method

Q.71 In the alumino thermite process, Al acts as
(A) An oxidising agent (B) A flux (C) A reducing agent (D) A solder

Q.72 The process of the isolation of a metal by dissolving the ore in a suitable chemical reagent followed by precipitation of the metal by a more electropositive metal is called:
(A) hydrometallurgy (B) electrometallurgy (C) zone refining (D) electrorefining

Q.73 Carbon cannot be used in the reduction of Al_2O_3 because :
(A) it is an expensive proposition
(B) the enthalpy of formation of CO_2 is more than that of Al_2O_3
(C) pure carbon is not easily available
(D) the enthalpy of formation of Al_2O_3 is too high.

Q.74 Froth floatation process for concentration of ores is an illustration of the practical application of:
(A) Adsorption (B) Absorption (C) Coagulation (D) Sedimentation

Q.75 Which process of purification is represented by the following equation :

$$Ti\ (Impure) + 2I_2 \xrightarrow{250°C} TiI_4 \xrightarrow{1400°C} Ti\ (Pure) + 2I_2$$

(A) Cupellation (B) Poling (C) Van-Arkel Process (D) Zone refining

Q.76 Mercury is purified by:
(A) Passing through dilute HNO_3 (B) Distillation
(C) Distribution (D) Vapour phase refining

Q.77 Which of the following ore and metal are correctly matched:

	Ore	**Metal**
(A)	Carnallite	Zinc
(B)	Calamine	Titanium
(C)	Ilmenite	Magnesium
(D)	Chalcopyrite	Copper

Q.78 Which of the following metal is correctly matched with its ore:

	Metal	**Ore**
(A)	Zinc	Calamine
(B)	Tin	Azurite
(C)	Magnesium	Cassiterite
(D)	Silver	Ilmenite

Q.79 Which of the following employ(s) thermal decomposition of volatile iodide compounds?
(A) Thermite process (B) Hall's process (C) Van-Arkel's process (D) Mond's process

Q.80 The method of zone refining of metals is based on the principle of:
(A) Greater mobility of the pure metal than that of impurity.
(B) Higher melting point of the impurity than that of the pure metal.
(C) Greater noble character of the solid metal than that of the impurity
(D) Greater solubility of the impurity in the molten state than in the solid

Q.81 Railway wagon axles are made by heating iron rods embedded in charcoal powder. This process is known as:
(A) Sherardising (B) Annealing (C) Tempering (D) Case hardening

Q.82 In the extraction of copper from its sulphide are the metal is formed by the reduction of Cu_2O with:
(A) FeS (B) CO (C) Cu_2S (D) SO_2

Q.83 Carnallite on electrolysis gives:
(A) Ca and Cl_2 (B) Na and CO_2 (C) Al and Cl_2 (D) Mg and Cl_2

Q.84 Among the following statemetns, the incorrect one is:
(A) Calamine and siderite are carbonates (B) Argentite and cuperite are oxides
(C) Zinc blende and iron pyrites are sulphides (D) Malachite and azurite are ores of copper

Q.85 Match List I and II and select the correct answer using the codes given below the lists:

	List I		**List II**
I.	Cyanide process	(1)	Ultrapure Ge
II.	Floatation process	(2)	Dressing of HgS
III.	Electrolytic reduction	(3)	Extraction of Al
IV.	Zone refining	(4)	Extraction of Au

(A) I–(3), II–(1), III–(4), IV–(2) (B) I–(4), II–(2), III–(3), IV–(1)
(C) I–(3), II–(2), III–(4), IV–(1) (D) I–(4), II–(1), III–(3), IV–(2)

Q.86 Match **Column-I** with **Column-II** and select the correct answer using the codes given below .

	Column-I (Metals)		**Column-II (Method used for refining)**
(i)	Iron & copper	(P)	Poling
(ii)	Zirconium & Titanium	(Q)	Bessemerisation
(iii)	Lead & Tin	(R)	Van-Arkel
(iv)	Copper & Tin	(S)	Liquation

	(i)	(ii)	(iii)	(iv)
(A)	P	S	R	Q
(B)	Q	S	R	P
(C)	P	R	S	Q
(D)	Q	R	S	P

Question No. 87 to 100

Questions given below consist of two statements each printed as Assertion (A) and Reason (R); while answering these questions you are required to choose any one of the following four responses:

(A) if both (A) and (R) are true and (R) is the correct explanation of (A)

(B) if both (A) and (R) are true but (R) is not correct explanation of (A)

(C) if (A) is true but (R) is false

(D) if (A) is false and (R) is true

Q.87 **Assertion :** Sulphide ores are concentrated by froth floatation process.
Reason : Pine oil acts as a frothing agent in froth floatation process.

Q.88 **Assertion :** Platinum and gold occur in native state in nature.
Reason : Platinum and gold are noble metals.

Q.89 **Assertion :** Wolframite impurities are separated from cassiterite by electromagnetic separation.
Reason : Cassiterite being magnetic is attacted by the magnet and forms a separate heap.

Q.90 **Assertion :** In smelting, roasted ore is heated with powdered coke in presence of a flux.
Reason : Oxides are reduced to metals by C or CO. Impurities are removed as slag.

Q.91 **Assertion :** Al is used as a reducing agent in aluminothermy.
Reason : Al has a lower melting point than Fe, Cr and Mn.

Q.92 **Assertion :** Lead, tin and bismuth are purified by liquation method.
Reason : Lead, tin and bismuth have low m.p. as compared to impurities.

Q.93 **Assertion :** Wolframite impurity is separated from SnO_2 by magnetic separation
Reason : Tin stone is ferromagnetic, therefore attracted by magnet.

Q.94 **Assertion :** Titanium is purified by Van-Arkel method.
Reason : Ti reacts with I_2 to form TiI_4 which decomposes at 1700 K to give pure Ti.

Q.95 **Assertion :** CuO can be reduced by C, H_2 as well as CO
Reason : CuO is basic oxide.

Q.96 **Assertion :** Alkali metals can not be prepared by the electrolysis of their chlorides in aqueous solution
Reason : Reduction potentials of alkali metals cations is much lower than that of H^+.

Q.97 **Assertion :** Magnesium can be prepared by the electrolysis of aq. $MgCl_2$.
Reason : The reduction potential of Mg^{2+} is much lower than that of H^+.

Q.98 **Assertion :** Titanium can be purified by Van-Arkel process.
Reason : TiI_4 is a volatile, stable compound.

Q.99 **Assertion :** Magnesia and quick lime are used as basic flux.
Reason : MgO and CaO can withstand very high temperatures.

Q.100 **Assertion :** Nickel is purified `by the thermal decomposition of nickel tetracarbonyl.
Reason : Nickel is a transitional element.

ONE OR MORE THAN ONE OPTION MAY BE CORRECT

Q.1 Hoop's process of purification of aluminium involves formation of layers during electrolysis. It involves
(A) the three layers have same densities but different materials.
(B) the three layers have different densities
(C) the upper layer is of pure aluminium which acts as a cathode
(D) the bottom layer is of impure aluminium which acts as an anode and middle layer consists of cryolite and BaF_2.

Q.2 Metallurgical process of zinc involves roasting of zinc sulphide followed by reduction. Metallic zinc distills over as it is volatile and impurities like Cd, Pd and Fe gets condensed. The crude metal obtained is called spelter, which may be purified by
(A) electrolysis process (B) fractional distillation
(C) polling (D) heating with iodine

Q.3 Calcination and roasting processes of reduction of ores to their oxides are beneficial
(A) to convert ores into porous form so that their reduction becomes easier
(B) as volatile impurities like P, As, Sb, S are removed
(C) as organic impurities are removed.
(D) as the ores are converted into oxide form which makes the reduction easier

Q.4 In the extraction of copper, the reaction which takes place in Bessemer converter is
(A) $2Cu_2O + Cu_2S \longrightarrow 6Cu + SO_2 \uparrow$ (B) $CuFeS_2 + O_2 \longrightarrow Cu_2S + 2FeS + SO_2 \uparrow$
(C) $2Cu_2S + 3O_2 \longrightarrow 2Cu_2O + 2SO_2 \uparrow$ (D) $2FeS + 3O_2 \longrightarrow 2FeO + 2SO_2$

Q.5 Extraction of silver from argentiferrous lead (Pb +Ag) involves
(A) distillation method (B) cupellation
(C) froth flotation method (D) treatment with NaCl

Q.6 In the manufacturing of metallic sodium by fused salt-electrolysis method (Down's process), small amount of $CaCl_2$ that added is known as auxiliary electrolyte and is used to
(A) improve the electrical conductance (B) decrease the melting point of NaCl
(C) stabilise the metallic sodium (D) increase the temperature of electrolysis

Q.7 Metal(s) which does/do not form amalgam is/are
(A) Fe (B) Pt (C) Zn (D) Au

Q.8 Auto reduction process is used in extraction of
(A) Cu (B) Hg (C) Al (D) Fe

Q.9 Zone refining is used for purification of
(A) Ge (B) Si (C) Ga (D) Se

Q.10 Which of the following process (es) are used for purification of Bauxite ore?
(A) Hall's process (B) Serpeck's process (C) Baeyer's process (D) Mond's process

Q.11 Metals which can be extracted by smelting process
(A) Pb (B) Fe (C) Zn (D) Mg

Q.12 Common impurities present in Bauxite are
(A) CuO (B) ZnO (C) Fe_2O_3 (D) SiO_2

Q.13 Which of the following reduction reactions are actually employed in commerical extraction of metals?
(A) $Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2Fe$
(B) $Cr_2O_3 + 2Al \rightarrow Al_2O_3 + 2Cr$
(C) $2Na[Au(CN)_2] + Zn \rightarrow Na_2[Zn(CN)_4] + 2Au$
(D) $Cu_2S + Pb \rightarrow Cu + PbS \downarrow$

Q.14 Which of the following cannot be obtained by electrolytic reduction of their compounds in aqueous solution?
(A) Barium (B) Cadmium (C) Potassium (D) nickel

Q.15 Which of the following ores is(are) concentrated by froth floatation?
(A) haematite (B) galena (C) copper pyrite (D) azurite

Q.16 Which of the following statements is/are common between roasting and sintering?
(A) Both require heating of the ore.
(B) Both involve burning away of organic matter.
(C) Both the process cause partial fusion of ore, resulting in bigger lumps.
(D) Both are performed only for sulphide ores.

Q.17 Which of the following reaction(s) occur during calcination?
(A) $CaCO_3 \rightarrow CaO + CO_2$ (B) $4FeS_2 + 11O_2 \rightarrow 2Fe_2O_3 + 8SO_2$
(C) $2Al(OH)_3 \rightarrow Al_2O_3 + 3H_2O$ (D) $CuS + CuSO_4 \rightarrow 2Cu\ 2SO_2$

Q.18 Roasting is usually performed in
(A) blast furnace (B) reverberatory furnace
(C) Bessemer's converter (D) electric furnace

Q.19 Which of the following is(are) sulphide ores?
(A) Argentite (B) Galena (C) Anglesite (D) Copper glance

Q.20 Which of the following is(are) regarded as iron ores?
(A) Haematite (B) Magnetite (C) Limonite (D) Copper pyrites

Q.21 Which of the following employ downward movement of ore due to gravity?
(A) Gravity separation (B) Froth floatation
(C) Blast furnace (D) Bessemer's coverter

Q.22 Calcium silicate slag formed in extraction of iron
(A) prevents the reoxidation of molten iron. (B) catalyses the combustion of carbon.
(C) reduces CO_2 toCO at the bottom of the furnace. (D) is used in cement industry.

Q.23 Amphoteric nature of aluminium is employed in which of the following process for extraction of aluminium?
(A) Baeyer's process (B) Hall's process
(C) Serpek's process (D) Dow's process

Q.24 Noble metal(s) which are commercially extracted by cyanide process is(are)
(A) copper (B) silver (C) gold (D) mercury

Q.25 Carbon reduction method is employed for commercial extraction of
(A) haematite (B) cassiterite (C) iron pyrite (D) corundum

Q.26 The chief rection(s) occuring in blast furnace during extraction of iron from haematite is(are)
(A) $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$ (B) $FeO + SiO_2 \rightarrow FeSiO_3$
(C) $Fe_2O_3 + C \rightarrow 2Fe + 3CO$ (D) $CaO + SiO_2 \rightarrow CaSiO_3$

Q.27 Which of the following are true for electrolytic extraction of aluminium
(A) cathode material contains graphite (B) anode material contains graphite
(C) cathode reacts away forming CO_2 (D) anode reacts away forming CO_2

Q.28 During extraction of copper, it is obtained in the form of molten *matte*. Which of the following is **not true**?
(A) *matte* is further treated reverbratory furnace
(B) molten *matte* is electrolysed
(C) It is treated with a blast of air and sand
(D) It is dissolved in $CuSiF_6$ and crystallised.

Q.29 Which of the following ores is (are) concentrated industrially by froth floatation?
(A) Copper pyrites (B) Galena (C) Dolomite (D) Carnallite

Q.30 Which of the following is true for calcination of a metal ore?
(A) It makes the ore more porous
(B) The ore is heated to a temperature when fusion just begins
(C) Hydrated salts lose their water of crystallisation
(D) Impurities of S, As and Sb are removed in the form of their volatile oxides.

Q.31 The major role of fluorspar (CaF_2) which is added in small quantities in the electrolytic reduction of alumina dissolved in fused cryolite (Na_3AlF_6) is
(A) as a catalyst
(B) to make the fused mixture very conducting
(C) to lower the temperature of the melt
(D) to decrease the rate of oxidation of carbon at the anode.

Q.32 The difference(s) between roasting and calcination is (are)
(A) roasting is highly endothermic while calcination is not.
(B) partial fusion occurs in calcination but not in roasting.
(C) calcination is performed in limited supply of air but roasting employs excess air.
(D) combustion reactions occur in roasting but not in calcination.

Q.33 Leaching is used for the concentration of:
(A) Red bauxite (B) Haematite (C) Gold ore (D) Silver ore

ANSWER KEY

ONLY ONE OPTION IS CORRECT.

Q.1	B	Q.2	B	Q.3	C	Q.4	A	Q.5	B	Q.6	A	Q.7	C
Q.8	D	Q.9	C	Q.10	D	Q.11	C	Q.12	B	Q.13	D	Q.14	C
Q.15	C	Q.16	C	Q.17	B	Q.18	B	Q.19	D	Q.20	D	Q.21	B,C
Q.22	C	Q.23	C	Q.24	A	Q.25	A	Q.26	A	Q.27	C	Q.28	A
Q.29	B	Q.30	A	Q.31	B	Q.32	C	Q.33	B,C	Q.34	C	Q.35	B
Q.36	B	Q.37	B	Q.38	B	Q.39	B	Q.40	A	Q.41	B	Q.42	C
Q.43	C	Q.44	B	Q.45	C	Q.46	A	Q.47	A	Q.48	D	Q.49	C
Q.50	B	Q.51	D	Q.52	A	Q.53	B	Q.54	D	Q.55	B	Q.56	B
Q.57	B	Q.58	B	Q.59	B	Q.60	A	Q.61	B	Q.62	A	Q.63	B
Q.64	A	Q.65	A	Q.66	D	Q.67	C	Q.68	A	Q.69	A	Q.70	D
Q.71	C	Q.72	A	Q.73	D	Q.74	A	Q.75	C	Q.76	B	Q.77	D
Q.78	A	Q.79	C	Q.80	D	Q.81	D	Q.82	C	Q.83	D	Q.84	B
Q.85	B	Q.86	D	Q.87	B	Q.88	A	Q.89	C	Q.90	A	Q.91	B
Q.92	A	Q.93	C	Q.94	A	Q.95	B	Q.96	A	Q.97	D	Q.98	A
Q.99	B	Q.100	B										

ONE OR MORE THAN ONE OPTION MAY BE CORRECT

Q.1	B,C,D	Q.2	A,B	Q.3	A,B,C,D	Q.4	A,C,D
Q.5	A,B	Q.6	A,B	Q.7	A,B	Q.8	A,B
Q.9	A,B,C	Q.10	A,B,C	Q.11	A,B,C	Q.12	C,D
Q.13	B,C	Q.14	A,C	Q.15	B,C	Q.16	A,B
Q.17	A,C	Q.18	A,B	Q.19	A,B,D	Q.20	A,B,C
Q.21	A,C	Q.22	A,D	Q.23	A,B	Q.24	B,C
Q.25	A,B	Q.26	A,D	Q.27	A, B,D	Q.28	B,D
Q.29	A,B	Q.30	A,C	Q.31	B,C	Q.32	C,D
Q.33	A,C,D						

Power Coaching

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TARGET IIT JEE

INORGANIC CHEMISTRY

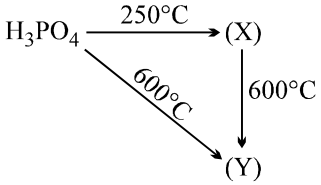
P-BLOCK ELEMENTS

ONLY ONE OPTION IS CORRECT

Q.1 Which is incorrectly matched?

(A) $CsBr_3$ ⎮ $Cs^+ + Br_3^-$ (B) I_4O_9 ⎮ $I^{3+} + (IO_3^-)_3$

(C) $AgBrO_3$ ⎮ $Ag^+ + BrO_3^-$ (D) I_2O_4 ⎮ $IO_2^- + IO_2^+$

Q.2 

(A) (X) = Pyrophosphoric acid (liquid), (Y) = Metaphosphoric acid (liquid)
(B) (X) = Pyrophosphoric acid (liquid), (Y) = Metaphosphoric acid (solid)
(C) (X) = Pyrophosphoric acid (solid), (Y) = Metaphosphoric acid (solid)
(D) (X) = Pyrophosphoric acid (solid), (Y) = Metaphosphoric acid (liquid)

Q.3 $H_3PO_2 \xrightarrow{\Delta} (X) + PH_3$; is
(A) Dehydration reaction (B) Oxidation reaction
(C) Disproportionation reaction (D) Dephosphorelation reaction

Q.4 Which of the following species is not a pseudohalide?

(A) CNO^- (B) $RCOO^-$ (C) OCN^- (D) N_3^-

Q.5 An orange solid (X) on heating, gives a colourless gas (Y) and a only green residue (Z). Gas (Y) on treatement with Mg, produces a white solid substance .....
(A) Mg_3N_2 (B) MgO (C) Mg_2O_3 (D) $MgCl_2$

Q.6 Conc. HNO_3 is yellow coloured liquid due to
(A) dissolution of NO in conc. HNO_3 (B) dissolution of NO_2 in conc. HNO_3
(C) dissolution of N_2O in conc. HNO_3 (D) dissolution of N_2O_3 in conc. HNO_3

Q.7 A gas at low temperature does not react with the most of compounds. It is almost inert and is used to create inert atmosphere in bulbs. The combustion of this gas is exceptionally an endothermic reaction. Based on the given information, we can conclude that the gas is
(A) oxygen (B) nitrogen (C) carbon mono-oxide (D) hydrogen

Q.8 When chlorine gas is passed through an aqueous solution of a potassium halide in the presence of chloroform, a voilet colouration is obtained. On passing more of chlorine water, the voilet colour is disappeared and solution becomes colourless. This test confirms the presence of ..... in aqueous solution.
(A) chlorine (B) fluorine (C) bromine (D) iodine

Q.9 $H_3PO_2 \xrightarrow{140°C} A \xrightarrow{250°C} B \xrightarrow{316°C} C$
Compound (C) is
(A) H_2PO_3 (B) H_3PO_3 (C) HPO_3 (D) $H_4P_2O_7$

Q.10 An explosive compound (A) reacts with water to produce NH_4OH and HOCl. Then, the compound (A), is
(A) TNG (B) NCl_3 (C) PCl_3 (D) HNO_3

Q.11 An inorganic salt (A) is decomposed at about 523 K to give products (B) and (C). Compound (C) is a liquid at room temperature and is neutral to litmus paper while oxide (B) on burning with white phosphorous, given a dehydrating agent (D). Compounds (A), (B), (C) and (D) will be identified as
(A) NH_4NO_3, N_2O, H_2O, P_2O_5 (B) NH_4NO_2, K_2O, H_2O, P_2O_5
(C) $CaCO_3$, CaO, H_2O, $CaCl_2$ (D) $CaCO_3$, CaO, H_2O, $Ca(OH)_2$

Q.12 An inorganic compound (A) made of two most occuring elements into the earth crust, having a polymeric tetra-headral network structure. With carbon, compound (A) produces a poisonous gas (B) which is the most stable diatomic molecule. Compounds (A) and (B) will be
(A) SiO_2, CO_2 (B) SiO_2, CO (C) SiC,CO (D) SiO_2, N_2

Q.13 A sulphate of a metal (A) on heating evolves two gases (B) and (C) and an oxide (D). Gas (B) turns $K_2Cr_2O_7$ paper green while gas (C) forms a trimer in which there is no S–S bond. Compound (D) with HCI, forms a Lewis base (E) which exists as a dimer. Compounds (A), (B), (C), (D) and (E) are respectively
(A) $FeSO_4$, SO_2, SO_3, Fe_2O_3, $FeCl_3$ (B) $Al_2(SO_4)_3$, SO_2, SO_3, Al_2O_3, $FeCl_3$
(C) FeS, SO_2, SO_3, $FeSO_4$, $FeCl_3$ (D) FeS, SO_2, SO_3 , $Fe_2(PO_4)_3$, $FeCl_2$

Q.14 A tetra-atomic molecule (A) on reaction with nitrogen(I)oxide, produces two substances (B) and (C). (B) is a dehydrating agent in its monomeric form while substance (C) is a diatomic gas which shows almost inert behaviour. The substances (A) and (B) and (C) respectively will be
(A) P_4, P_4O_{10}, N_2 (B) P_4, N_2O_5, N_2 (C) P_4, P_2O_3, Ar (D) P_4, P_2O_3, H_2

Q.15 First compound of inert gases was prepared by scientist Neil Barthlete in 1962. This compound is
(A) $XePtF_6$ (B) XeO_3 (C) XeF_6 (D) $XeOF_4$

Q.16 Carbongene has X% of CO_2 and is used as an antidote for poisoning of Y . Then, X and Y are
(A) X = 95% and Y = lead poisoning (B) X = 5% and Y = CO poisoning
(C) X = 30% and Y = CO_2 poisoning (D) X = 45% and Y = CO poisoning

Q.17 The correct order of acidic strength of oxides of nitrogen is
(A) $NO < NO_2 < N_2O < N_2O_3 < N_2O_5$ (B) $N_2O < NO < N_2O_3 < N_2O_4 < N_2O_5$
(C) $NO < N_2O < N_2O_3 < N_2O_5 < N_2O_4$ (D) $NO < N_2O < N_2O_5 < N_2O_3 < N_2O_4$

Q.18 Nitrogen dioxide is dissolved in water to produce
(A) HNO_3 and HNO_2(B) only HNO_3 (C) only HNO_2 (D) HNO_2 and N_2

Q.19 Consider two reactions
I. Zn + conc. HNO_3 (hot) $\rightarrow Zn(NO_3)_2 + X + H_2O$
II. Zn + dil. HNO_3 (cold) $\rightarrow Zn(NO_3)_2 + Y + H_2O$
Compounds X and Y are respectively
(A) N_2O, NO (B) NO_2, N_2O (C) N_2, N_2O (D) NO_2, NO

Q.20 $H_3BO_3 \xrightarrow{T_1} X \xrightarrow{T_2} Y \xrightarrow{\text{red hot}} B_2O_3$
if $T_1 < T_2$ then X and Y respectively are
(A) X = Metaboric acid and Y = Tetraboric acid
(B) X = Tetraboric acid and Y = Metaboric acid
(C) X = Borax and Y = Metaboric acid
(D) X = Tetraboric acid and Y = Borax

Q.21 Boron forms BX_3 type of halides. The correct increasing order of Lewis-acid strength of these halides is
(A) $BF_3 > BCl_3 > BBr_3 > BI_3$ (B) $BI_3 > BBr_3 > BCl_3 > BF_3$
(C) $BF_3 > BI_3 > BCl_3 > BBr_3$ (D) $BF_3 > BCl_3 > BI_3 > BBr_3$

Q.22 Which one of the following compounds on strong heating evolves ammonia gas?
(A) $(NH_4)_2SO_4$ (B) HNO_3 (C) $(NH_4)_2Cr_2O_7$ (D) NH_3NO_3

Q.23 The compound $(SiH_3)_3N$ is expected to be
(A) pyramidal and more basic than $(CH_3)_3N$ (B) planar and less basic than $(CH_3)_3N$
(C) pyramidal and less basic than $(CH_3)_3N$ (D) planar and more basic than $(CH_3)_3N$

Q.24 The correct order of acidic strength of oxy-acids of chlorine is
(A) $HClO < HClO_2 < HClO_3 < HClO_4$ (B) $HClO_4 < HClO_3 < HClO_2 < HClO$
(C) $HClO > HClO_4 > HClO_3 > HClO_2$ (D) $HClO_4 < HClO_2 > HClO_3 > HClO$

Q.25 In a molecule of phosphorus (V)oxide, there are
(A) 4P–P, 10P–O and 4P=O bonds (B) 12P–O and 4P=O bonds
(C) 2P–O and 4P=P bonds (D) 6P–P, 12P–O and 4P=P bonds

Q.26 The structures of O_3 and N_3^- are
(A) linear and bent, respectively (B) both linear
(C) both bent (D) bent and linear, respectively

Q.27 When conc. H_2SO_4 was treated with $K_4[Fe(CN)_6]$, CO gas was evolved. By mistake, somebody used dilute H_2SO_4 instead of conc. H_2SO_4 then the gas evolved was
(A) CO (B) HCN (C) N_2 (D) CO_2

Q.28 $\underset{(\text{organic Compound})}{A} + O_2 \longrightarrow X + Y + Z$

Compound (A) in pure form does not give ppt. with $AgNO_3$ solution. A mixture cootaining 70% of (A) and 30% of ether is used as an anaesthetic. Compound (X) and (Y) are oxides while (Z) is a pungent smelling gas. (X) is a neutral oxide which turns cobalt chloride paper pink. Compound (Y) turns lime water milky and produces an acidic solution with water. Compounds (A), (X), (y) and (Z) respectively will be
(A) CH_4, H_2O, CO_2, Cl_2 (B) $CHCl_3$, H_2O, CO_2, Cl_2
(C) CH_3OH, H_2O, CO_2, N_2 (D) NH_2CONH_2, H_2O, N_2O, CO_2

Q.29 An inorganic white crystalline compound (A) has a rock salt structure. (A) on reaction with cone. H_2SO_4 and MnO_2, evolves a pungent smelling, greenish-yellow gas (B). Compound (A) gives white ppt. of (C) with $AgNO_3$ solution. Compounds (A), (B) and (C) will be respectively
(A) NaCl, Cl_2, AgCl (B) NaBr, Br_2, NaBr (C) NaCl, Cl_2, Ag_2SO_4 (D) Na_zCO_3 , CO_2, Ag_2CO_3

Q.30 $RCl \xrightarrow[Si]{\text{cu-powder}} R_2SiCl_2 \xrightarrow{H_2O} R_2Si(OH)_2 \xrightarrow{\text{condensation}} A$

Compound (A) is
(A) a linear silicone (B) a chlorosilane (C) a linear silane (D) a network silane

Q.31 When oxalic acid reacts with cone. H_2SO_4 , two gases produced are of neutral and acidic in nature respectively. Potassium hydroxide absorbs one of the two gases. The product formed during this absorption and the gas which gets absorbed are respectively
(A) K_2CO_3 and CO_2 (B) $KHCO_3$ and CO_2 (C) K_2CO_3 and CO (D) $KHCO_3$ and CO

Q.32 Concentrated HNO_3 reacts with iodine to give
(A) HI (B) HOI (C) $HOIO_2$ (D) $HOIO_3$

Q.33 Conc. H_2SO_4 cannot be used to prepare HBr from NaBr because it
(A) reacts slowly with NaBr (B) oxidises HBr
(C) reduces HBr (D) disproportionates HBr

Q.34 $CH_2 \begin{cases} COOH \\ COOH \end{cases} \xrightarrow{P_4O_{10},\ 150°C} X$

Compound (X) is
(A) malonic acid (B) carbon suboxide (C) tartaric acid (D) acetic acid

Q.35 Molecular shapes of SF_4, CF_4 and XeF_4 are
(A) the same, with 2, 0 and 1 lone pairs of electrons respectively
(B) the same, with 2, 0 and 1 lone pairs of electrons respectively
(C) the different, with 0, 1 and 2 lone pairs of electrons respectively
(D) the different, with 1, 0 and 2 lone pairs of electrons respectively

Q.36 Match List-I with List-II

List-I	Chemical reaction	List-II	Name of process
I.	$4NH_3 + 5O_2 \xrightarrow{800°C/Pt} 4NO + 6H_2O$	(a)	Contact process
II.	$4HCl + O_2 \xrightarrow[450–500°/V_2O_5]{3230°C/CuCl_2} 2Cl_2 + 2H_2O$	(b)	Ostwald's process
III.	$2SO_2 + O_2 \longrightarrow 2SO_3$	(c)	Deacon's process
IV.	$2N_2 + 3H_2 \xrightarrow{Fe+Mo} 2NH_3$	(d)	Haber's proces

(A) I-a, II-b, III-d, IV-c (B) I-b, II-c, III-a, IV-d
(C) I-a, II-d, III-c, IV-b (D) I-a, II-c, III-b, IV-d

Q.37 Ammonia can be dried by
(A) conc. H_2SO_4 (B) P_4O_{10} (C) CaO (D) anhydrous $CaCl_2$

Q.38 When chlorine reacts with a gas X, an explosive inorganic compound Y is formed. Then X and Y will be
(A) X = O_2 and Y = NCl_3 (B) X = NH_3 and Y=NCl_3
(C) X = O_2 and Y = NH_4Cl (D) X = NH_3 and Y = NH_4Cl

Q.39 The solubility of anhydrous $AlCl_3$ and hydrous $AlCl_3$ in diethyl ether are S_1 and S_2 respectively. Then
(A) $S_1 = S_2$ (B) $S_1 > S_2$ (C) $S_1 < S_2$ (D) $S_1 < S_1$ but not $S_1 = S_2$

Q.40 Which one of the following statements is not true regarding diborane?
(A) It has two bridging hydrogens and four perpendicular to the rest.
(B) When methylated, the product is $Me_4B_2H_2$.
(C) The bridging hydrogens are in a plane perpendicular to the rest.
(D) All the B–H bond distances are equal.

Q.41 When $AgNO_3$ is heated strongly, the products formed are
(A) NO and NO_2 (B) NO_2 and O_2 (C) NO_2 and N_2O (D) NO and O_2

Q.42 $HNO_3 + P_4O_{10} \longrightarrow HPO_3 + A$; the product A is
(A) N_2O (B) N_2O_3 (C) NO_2 (D) N_2O_5

Q.43 Which of the following is the correct order of acidic strength?
(A) $Cl_2O_7 > SO_2 > P_4O_{10}$ (B) $CO_2 > N_2O_5 > SO_3$
(C) $Na_2O > MgO > Al_2O_3$ (D) $K_2O > CaO > MgO$

Q.44 $Ca + C_2 \longrightarrow CaC_2 \xrightarrow{N_2} A$
Compound (A) is used as a/an
(A) fertilizer (B) dehydrating agent (C) oxidising agent (D) reducing agent

Q.45 A gas which exists in three allotropic forms α, β and γ is
(A) SO_2 (B) SO_3 (C) CO_2 (D) NH_3

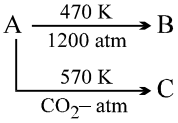
Q.46 A red coloured mixed oxide (X) on treatment with cone. HNO_3 gives a compound (Y). (Y) with HCl, produces a chloride compound (Z) which can also be produced by treating (X) with cone. HCl. Compounds (X) , (Y), and (Z) will be
(A) Mn_3O_4, MnO_2, $MnCl_2$ (B) Pb_3O_4, PbO_2, $PbCl_2$
(C) Fe_3O_4, Fe_2O_3, $FeCl_2$ (D) Fe_3O_4, Fe_2O_3, $FeCl_3$

Q.47 There is no S–S bond in
(A) $S_2O_4^{2-}$ (B) $S_2O_5^{2-}$ (C) $S_2O_3^{2-}$ (D) $S_2O_7^{2-}$

Q.48 One mole of calcium phosphide on reaction with excess of water gives
(A) one mole of phosphine (B) two moles of phosphoric acid
(C) two moles of phosphine (D) one mole of phosphorus penta-oxide

Q.49 $NaH_2PO_4 \xrightarrow{230°C} Na_2(P_3O_9) \xrightarrow{638°C} (NaPO_3)_n \longrightarrow$ D (glossy solid)
Compound (D) is sodium hexametaphosphate which is known as
(A) Bunsen's salt (B) Graham's salt (C) Reimann's salt (D) Werner's salt

Q.50 Three allotropes (A), (B) and (C) of phoiphorous in the following change are respectively



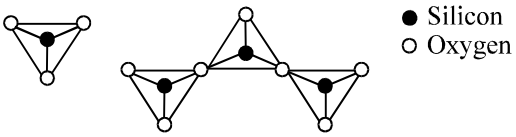
(A) white, black, red (B) black, white, red (C) red, black, white (D) red, violet, black

Q.51 When an inorganic compound reacts with SO_2 in aqueous medium, produces (A). (A) on reaction with Na_2CO_3, gives compound (B) which with sulphur, gives a substance (C) used in photography. Compound (C) is
(A) Na_2S (B) $Na_2S_2O_7$ (C) Na_2SO_4 (D) $Na_2S_2O_3$

Q.52 Borax is actually made of two tetrahedra and two triangular units joined together and should be written as: $Na_2[B_4O_5(OH)_4]\cdot 8H_2O$
Consider the following statements about borax:
a. Each boron atom has four B–O bonds
b. Each boron atom has three B–O bonds
c. Two boron atoms have four B–O bonds while other two have three B–O bonds
d. Each boron atom has one –OH groups
Select correct statement(s):
(A) a, b (B) b, c (C) c, d (D) a, c

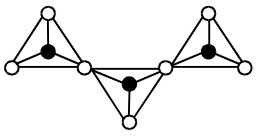
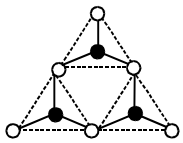
Question No. 53 to 55 (3 questions)
Read the following short write-up and answer the questions at the end of it
The name **'silica'** covers an entire group of minerals, which have the general formula SiO_2, the most common of which is **quartz**. Quartz is a framework silicate with SiO_4 tetrahedra arranged in spirals. The spirals can turn in a clockwise or anticlockwise direction – a feature that results in there being two mirror images, optically active, varieties of quartz.

Q.53 The following pictures represent various silicate anions. Their formulae are respectively:



(A) SiO_3^{2-} $Si_3O_7^{2-}$ (B) SiO_4^{4-} $Si_3O_{10}^{8-}$
(C) SiO_4^{2-} $Si_3O_9^{2-}$ (D) SiO_3^{4-} $Si_3O_7^{8-}$

Q.54 $Si_3O_9^{6-}$ (having three tetrahedral) is represented as:

(A)  (B) 
(C) both (D) none

Q.55 The silicate anion in the mineral kinoite is a chain of three SiO_4 tetrahedra that share corners with adjacent tetrahedra. The mineral also contains Ca^{2+} ions, Cu^{2+} ions, and water molecules in a 1:1:1 ratio mineral is represented as:
(A) $CaCuSi_3O_{10}\cdot H_2O$ (B) $CaCuSi_3O_{10}\cdot 2H_2O$
(C) $Ca_2Cu_2Si_3O_{10}\cdot 2H_2O$ (D) none of these

Question No. 56 to 57 (2 questions)

Questions given below are based on electronic configurations of the elements. The three elements X, Y and Z with the electronic configurations shown below all form hydrides:

Element	Electronic configuration
X	$1s^2, 2s^2, 2p^2$
Y	$1s^2, 2s^2, 2p^6, 3s^1$
Z	$1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^{10}, 4s^2, 4p^5$

Q.56 Which line of properties (A, B, C, or D) correctly lists properties of the hydrides of these elements?

	Hydride of X	Hydride of Y	Hydride of Z
(A)	Colourless gas insoluble in H_2O	Silver/grey solid, reacts with H_2O to form an alkaline solution	Colourless gas form a strong acid in H_2O
(B)	Colourless liquid, no reaction with H_2O	Silver/grey solid, forms H_2O	Ionic solid with formula ZH
(C)	Colourless gas found naturally	Does not conduct electricity in the molten state	Colourless gas, reacts with Cl_2
(D)	Non-polar compound reacts with Cl_2 in light	Silver/grey ionic solid with formula YH_2	Forms when water is added to phosphorus and element Z

Q.57 Which of the following exists as gas?

(A) X_2 (B) Y_2 (C) Z_2 (D) all of the above

Question No. 58 to 59 (2 questions)

Read the following write-ups and answer the questions at the end of it.

Silicons are synthetic polymers containing repreated R_2SiO units. Since, the empirical formula is that of a ketone (R_2CO), the name silicone has been given to these materials. Silicones can be made into oils, rubbery elastomers and resins. They find a variety of applications because of their chemical inertness, water repelling nature, heat-resistance and good electrical insulating property.

Commercial silicon polymers are usually methyl derivatives and to a lesser extent phenyl derivatives and are synthesised by the hydrolysis of

R_2SiCl_2[R=methyl (Me) or phenyl (ϕ)]

$$Me_2SiCl_2 \xrightarrow{H_2O} O-\underset{\underset{Me}{|}}{\overset{\overset{Me}{|}}{Si}}-O-\underset{\underset{Me}{|}}{\overset{\overset{Me}{|}}{Si}}-O-\underset{\underset{Me}{|}}{\overset{\overset{Me}{|}}{Si}}-O-$$

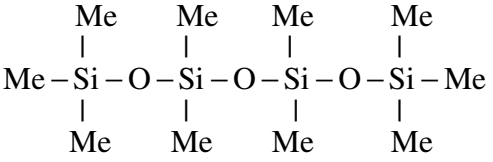
Q.58 If we mix Me_3SiCl with Me_2SiCl_2, we get silicones of the type:

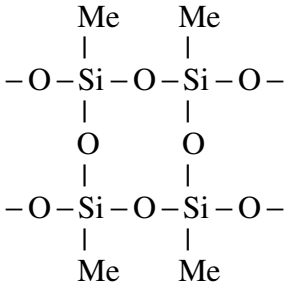
(A) $Me-\underset{\underset{Me}{|}}{\overset{\overset{Me}{|}}{Si}}-O-\underset{\underset{Me}{|}}{\overset{\overset{Me}{|}}{Si}}-O-\underset{\underset{Me}{|}}{\overset{\overset{Me}{|}}{Si}}-O-\underset{\underset{Me}{|}}{\overset{\overset{Me}{|}}{Si}}-Me$

(B) $-O-\underset{\underset{O}{|}}{\overset{\overset{Me}{|}}{Si}}-O-\underset{\underset{O}{|}}{\overset{\overset{Me}{|}}{Si}}-O-$
$-O-\underset{\underset{Me}{|}}{\overset{\overset{O}{|}}{Si}}-O-\underset{\underset{Me}{|}}{\overset{\overset{O}{|}}{Si}}-O-$

(C) both of the above (D) none of the above

Q.59 If we start with $MeSiCl_3$ as the starting material, silicones formed is:

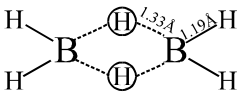
(A) 

(B) 

(C) both of the above

(D) none of the above

Q.60 The molecular shapes of diborane is shown:



Consider the following statements for diborane:

1. Boron is approximately sp^3 hybridised
2. B–H–B angle is 180°
3. There are two terminal B–H bonds for each boron atom
4. There are only 12 bonding electrons available

Of these statements:

(A) 1, 3 and 4 are correct

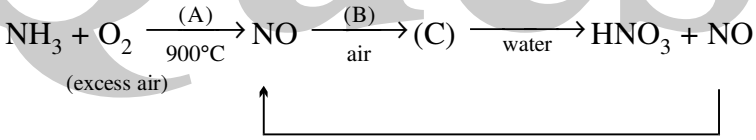
(B) 1, 2 and 3 are correct

(C) 2, 3 and 4 are correct

(D) 1, 2 and 4 are correct

Question No. 61 to 62 (2 questions)

The following flow diagram represents the industrial preparation of nitric acid from ammonia:



Answer the questions given below:

Q.61 Which line of entry describes the undefined reagents, products and reaction conditions?

	A	B	C
(A)	catalyst	R.T. (25°C)	NO_2
(B)	catalyst	R.T. (25°C)	N_2O
(C)	catalyst	high pressure	NO_2
(D)	high pressure	catalyst	N_2O_3

Q.62 Formation of HNO_3 when (C) is dissolved in H_2O takes place through various reactions. Select the reaction not observed in this step.

(A) $NO_2 + H_2O \longrightarrow HNO_3 + HNO_2$

(B) $HNO_2 \longrightarrow H_2O + NO + NO_2$

(C) $NO_2 + H_2O \longrightarrow HNO_3 + NO$

(D) none of these

Q.63 $B(OH)_3 + NaOH \rightleftharpoons NaBO_2 + Na[B(OH)_4] + H_2O$
How can this reaction is made to proceed in forward direction?
(A) addition of cis 1,2 diol (B) addititon of borax
(C) addition of trans 1,2 diol (D) addition of Na_2HPO_4

Question No. 64 to 71 (8 questions)
Questions given below consist of two statements each printed as Assertion (A) and Reason (R); while answering these questions you are required to choose any one of the following four responses:
(A) if both (A) and (R) are true and (R) is the correct explanation of (A)
(B) if both (A) and (R) are true but (R) is not correct explanation of (A)
(C) if (A) is true but (R) is false
(D) if (A) is false and (R) is true

Q.64 **Assertion :** Borax bead test is applicable only to coloured salt.
Reason : In borax bead test, coloured salts are decomposed to give coloured metal meta borates.

Q.65 **Assertion :** Aluminium and zinc metal evolve H_2 gas from NaOH solution
Reason : Several non-metals such as P, S, Cl, etc. yield a hydride instead of H_2 gas from NaOH

Q.66 **Assertion :** Conc. H_2SO_4 can not be used to prepare pure HBr from NaBr
Reason : It reacts slowly with NaBr.

Q.67 **Assertion :** Oxygen is more electronegative than sulphur, yet H_2S is acidic, while H_2O is neutral.
Reason : H–S bond is weaker than O–H bond.

Q.68 **Assertion :** $Al(OH)_3$ is amphoteric in nature.
Reason : It can not be used as an antacid.

Q.69 **Assertion :** Chlorine gas disproportionates in hot & conc. NaOH solution.
Reason : NaCl and NaOCl are formed in the above reaction.

Q.70 **Assertion :** Silicones are very inert polymers.
Reason : Both Si–O and Si–C bond energies are very high.

Q.71 **Assertion :** Liquid IF_5 conducts electricity.
Reason : Liquid IF_5 self ionizes as, $2IF_5 \rightleftharpoons IF_4^+ + IF_6^-$

ONE OR MORE THAN ONE OPTION MAY BE CORRECT

Q.1 When a compound X reacts with ozone in aqueous medium, a compound Y is produced. Ozone also reacts with Y and produces compound Z. Z acts as an oxidising agent, then X, Y and Z will be
(A) X = HI, Y = I_2 and Z = HIO_3 (B) X = KI, Y = I_2 and Z = HIO_3
(C) X = KI, Y = I_2 and Z = HIO_4 (D) X = HI, Y = I_2 and Z = HIO_4

Q.2 Which of the following statements is/are correct regarding B_2H_6?
(A) banana bonds are longer but stronger than normal B–H bonds
(B) B_2H_6 is also known as 3c–2e compound
(C) the hybrid state of B in B_2H_6 is sp^3 while that of sp^2 in BH_3
(D) it cannot be prepared by reacting BF_3 with $LiBH_3$ in the presence of dry ether

Q.3 Which of the following pairs of nitrates gives the same gaseous products on thermal decomposition?
(A) KNO_3 and $Pb(NO_3)_2$ (B) KNO_3 and $NaNO_3$
(C) $Pb(NO_3)_2$ and $Cu(NO_3)_2$ (D) $NaNO_3$ and $Ca(NO_3)_2$

Q.4 $2NO_2$ ⇌ N_2O_4The dimerisation of NO_2 is accompanied with
(A) decrease in paramagnetism (B) change in colour
(C) increase in temperature' (D) increase in paramagnetism

Q.5 $C(OH)_4$ is unstable because a carbon atom cannot hold more than one –OH groups but $Si(OH)_4$ is a stable compound because
(A) C–O bond energy is low (B) C–O bond energy is high
(C) Si-O bond energy is low (D) Si-O bond energy is high

Q.6 Which of the following statements is/are correct regarding inter-halogen compounds of ABx types?
(A) x may be 1,3,5 and 7
(B) A is a more electronegative halogen than B
(C) FBr_3 cannot exit
(D) the structures of ClF_3 and IF_7 show deviation from normal structures and could be explained on the basis of VSEPR theory

Q.7 When an inorganic compound (X) having 3e-2e as well as 2e-2e bonds reacts with ammonia gas at a certain temperature, gives a compound (Y) iso-structural with benzene. Compound (X) with ammonia at a high temperature, produces a hard substance (Z). Then
(A) (X) is B_2H_6 (B) (Z) is known as inorganic graphite
(C) (Z) having structure similar to graphite (D) (Z) having structure similar to (X)

Q.8 Boric acid
(A) exists in polymeric form due to inter-molecular hydrogen bonding.
(B) is used in manufacturing of optical glasses.
(C) is a tri-basic acid
(D) with borax, it is used in the preparation of a buffer solution.

Q.9 The correct statement(s) related to allotropes of carbon is/are
(A) graphite is the most stable allotropes of carbon and having a two dimensional sheet like structure of hexagonal rings of carbon (sp^2)
(B) diamond is the hardest allotrope of carbon and having a three dimensional network structure of C(sp^3)
(C) fullerene (C_{60}) is recently discovered non-crystalline allotrope of carbon having a football-like structure.
(D) Vander Waal's force of attraction acts between the layers of graphite 6.14 Å away from each other

Q.10 $Al_2(SO_4)_3 + NH_4OH \longrightarrow X$, then
(A) X is a white coloured compound
(B) X is insoluble in excess of NH_4OH
(C) X is soluble in NaOH
(D) X cannot be used as an antacid

Q.11 The hybrid states of phosphorous atoms in each PCl_5 and PBr_3 in gaseous phase are sp^3d. But, in solid PCl_5, phosphorous shows sp^3d^2 and sp^3 hybrid states. While, P in PBr_5 is in Sp^3 hybrid state. This is because
(A) PCl_5 in solid form exists as $[PCl_4]^+[PCI_6]^-$
(B) PBr_5 in solid form exists as $[PCI_4]^+[PBr_6]^-$
(C) PCl_5 in solid form exists as $[PCI_4]^+Cl^-$
(D) PBr_5 in solid form exists as $[PBr_4]^+Br^-$

Q.12 The species that undergo(es) disproportionation in an alkaline medium is/are
(A) Cl_2 (B) MnO_4^{2-} (C) NO_2 (D) ClO_4^-

Q.13 Select correct statement(s):
(A) Borax is used as a buffer
(B) 1 M borax solution reacts with equal volumes of 2 M HCl solution
(C) Titration of borax can be made using methyl orange as the indicator
(D) Coloured bead obtained in borax-bead test contains metaborate

Q.14 Select correct statement about B_2H_6
(A) Bridging groups are electron-deficient with 12 valence electrons
(B) It has 2c - 2e B–H bonds
(C) It has 3c - 2e B–H–B bonds
(D) All of above are correct statements

Q.15 Which of the following is / are correct for group 14 elements?
(A) The stability of dihalides are in the order $CX_2 < SiX_2 < GeX_2 < SnX_2 < PbX_2$
(B) The ability to form $p\pi$–$p\pi$ multiple bonds among themselves increases down the group
(C) The tendency for catenation decreases down the group
(D) They all form oxides with the formula MO_2.

Q.16 Match the following:

Column I	**Column II**
(A) $Bi^{3+} \rightarrow (BiO)^+$	(P) Heat
(B) $[AlO_2]^- \rightarrow Al(OH)_3$	(Q) Hydrolysis
(C) $SiO_4^{4-} \rightarrow Si_2O_7^{6-}$	(R) Acidification
(D) $(B_4O_7^{2-}) \rightarrow [B(OH)_3]$	(S) Dilution by water

ANSWER KEY

ONLY ONE OPTION IS CORRECT

Q.1	D	Q.2	B	Q.3	C	Q.4	B	Q.5	A	Q.6	B	Q.7	B
Q.8	D	Q.9	C	Q.10	B	Q.11	A	Q.12	B	Q.13	A	Q.14	A
Q.15	A	Q.16	B	Q.17	B	Q.18	A	Q.19	B	Q.20	A	Q.21	B
Q.22	A	Q.23	B	Q.24	A	Q.25	B	Q.26	D	Q.27	B	Q.28	B
Q.29	A	Q.30	A	Q.31	A	Q.32	C	Q.33	B	Q.34	B	Q.35	D
Q.36	B	Q.37	C	Q.38	B	Q.39	B	Q.40	D	Q.41	B	Q.42	D
Q.43	A	Q.44	A	Q.45	B	Q.46	B	Q.47	D	Q.48	C	Q.49	B
Q.50	A	Q.51	D	Q.52	C	Q.53	B	Q.54	B	Q.55	C	Q.56	A
Q.57	C	Q.58	A	Q.59	B	Q.60	A	Q.61	A	Q.62	D	Q.63	A
Q.64	A	Q.65	B	Q.66	C	Q.67	A	Q.68	C	Q.69	C	Q.70	A
Q.71	A												

ONE OR MORE THAN ONE OPTION MAY BE CORRECT

Q.1	A,B	Q.2	A,B,C	Q.3	B,C	Q.4	A,B
Q.5	A,D	Q.6	A,C	Q.7	A,B,C	Q.8	A,B,D
Q.9	A,B	Q.10	A,B,C	Q.11	A,D	Q.12	A,B,C
Q.13	A,B,C,D	Q.14	B,C	Q.15	A,C,D		

Q.16 A – Q,S; B – R; C – P; D – Q,R

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PRACTICE PROBLEMS FOR IIT JEE

(With Answers)

BEST OF LUCK FOR IITJEE

ONLY ONE OPTION IS CORRECT

Q.1 The metal X is prepared by the electrolysis of fused chloride. It reacts with hydrogen to form a colourless solid from which hydrogen is released on treatment with water. The metal is :
(A) Al (B) Ca (C) Cu (D) Zn

Q.2 Magnesium has polarising power close to that of
(A) Li (B) Na (C) K (D) Cs

Q.3 Mortar is a mixture of
(A) $Ca(OH)_2$ silica and water (B) $CaCO_3$ and SiO_2
(C) CaO and silica (D) $CaCO_3$, SiO_2 and water

Q.4 $Na_2CO_3 + Fe_2O_3 \rightarrow A + CO_2$ what is A in the reaction?
(A) $NaFeO_2$ (B) Na_3FeO_3 (C) Fe_3O_4 (D) Na_2FeO_2

Q.5 Ferrous sulphate on heating gives
(A) SO_2 and SO_3 (B) SO_2 only (C) SO_3 only (D) S only

Q.6 In comparison of ferrous salts, ferric salts are
(A) more stable (B) less stable (C) equally stable (D) none of these

Q.7 Sodium burns in air to give
(A) Na_2O (B) Na_2O_2 (C) NaO_2 (D) Na_3N

Q.8 Oxone is
(A) CaO (B) N_2O (C) Na_2O_2 (D) $NaBO_3$

Q.9 Which of the following is not an ore of magnesium?
(A) carnallite (B) magnesite (C) dolomite (D) gypsum

Q.10 At high temperature, nitrogen combines with CaC_2 to give
(A) calcium cyanide (B) calcium cyanamide (C) calcium carbonate (D) calcium nitride

Q.11 When magnesium burns in air, compounds of magnesium formed are magnesium oxide and
(A) Mg_3N_2 (B) $MgCO_3$ (C) $Mg(NO_3)_2$ (D) $Mg(NO_2)_2$

Q.12 Which of the following is different from other three oxides?
(A) MgO (B) SnO (C) ZnO (D) PbO

Q.13 When alumina is electrolysed in presence of cryolite, the gas liberated at graphite anode is
(A) F_2 (B) O_2 (C) CF_4 (D) F_2O

Q.14 In Nessler's reagent, the ion present is
(A) HgI^{2-} (B) HgI_4^{2-} (C) Hg^+ (D) Hg^{2+}

Q.15 Chrome yellow is chemically called
(A) lead chromate (B) lead sulphate (C) lead iodide (D) basic lead acetate

Q.16 Aluminium metal is purified by
(A) Hoope's process (B) Hall's process (C) Serpeck's process (D) Baeyer's process

Q.17 Which of the following is true for magnesium?
(A) It is more electropositive that sodium
(B) It is manufactured by electrolysis of aqueous magnesium chloride
(C) It is a strong reducing agent.
(D) It resembles, in chemical properties, with its diagonally placed element Boron in 13 group of the Periodic Table.

Q.18 A piece of magnesium ribbon was heated to redness in a atmosphere of nitrogen and then cooled with water. The gas evolved in
(A) Ammonia (B) Hydrogen (C) Nitrogen (D) Oxygen

Q.19 Magnesium burns in CO_2 to form
(A) MgO and Co (B) $MgCO_3$ (C) MgO and C (D) MgO_2.

Q.20 The more commonly used baking powder contains about 30% $NaHCO_3$, 20% $NaAl(SO_4)_2$, 10% $Ca(H_2PO_4)_2$ and 40% starch. Which of the following statements are correct?
(A) $Ca(H_2PO_4)_2$ is acidic and when moistened it reacts with $NaHCO_3$ evolving CO_2 gas
(B) $NaAl(SO_4)_2$ slows down the decomposition reaction of $NaHCO_3$ so that CO_2 is evolved more slowly.
(C) $NaAl(SO_4)_2$ is acidic and when moistened it reacts with $NaHCO_3$ evolving CO_2
(D) Both (A) and (B)

Q.21 Which of the following salts does not impart colour to the flame?
(A) $MgCl_2$ (B) $SrCl_2$ (C) $BaCl_2$ (D) LiCl

Q.22 Aluminium vessels should not be washed with materials containing washing soda since.
(A) washing soda reacts with aluminium to form soluble aluminate
(B) washing soda is expensive
(C) washing soda is easily decomposed
(D) washing soda reacts with aluminium to form insoluble aluminium oxide

Q.23 Al_2O_3 formation form aluminium and oxygen involves evolution of a large quantity of heat, which makes aluminium use in
(A) deoxidiser (B) confectionery (C) indoor photography (D) thermite welding

Q.24 $AlCl_3$ on hydrolysis gives
(A) $Al_2O_3.H_2O$ (B) $Al(OH)_3$ (C) Al_2O_3 (D) $AlCl_3.6H_2O$

Q.25 Which of the following methods cannot be used for the preparation of anhydrous aluminium chloride?
(A) Heating $AlCl_3.6H_2O$
(B) Heating a mixture of alumina and coke in a current of dry chlorine
(C) Passing dry HCl gas over heated aluminium powder
(D) Passing dry chlorine over heated aluminium

Q.26 Acidified solution of sodium thiosulphate are unstable because in thiosulphate
(A) The sulphur atoms are at unstable oxidation state of +2.
(B) The two sulphur atoms are at different oxidation states of +6 and –2
(C) The S–S bonds are unstable bonds
(D) Thio compounds contain sulphur in zero oxidation state

Q.27 Aluminothermy used for on the spot welding of large iron structures is based upon the fact that
(A) As compared to iron, aluminium has greater affinity for oxygen
(B) As compared to aluminium, iron has greater affinity for oxygen
(C) Reaction between aluminium and oxygen is endothermic
(D) Reaction between iron and oxygen is endothermic.

Q.28 Hydrated aluminium chloride is ionic and soluble in water giving
(A) Al^{3+} and Cl^- ions (B) $[Al(H_2O)_6]^{3+}$
(C) $[AlCl_2(H_2O)_4]^+$ and $[AlCl_4(H_2O)_2]^-$ (D) none of these

Q.29 When copper is placed in the atmosphere for sufficient time, a green crust is formed on its surface. The composition of the green crust is
(A) $Cu(OH)_2$ (B) CuO (C) $CuCO_3$ (D) $CuCO_3.Cu(OH)_2$

Q.30 Copper is extracted from sulphide ore using the method
(A) carbon reduction (B) carbon monoxide reduction (C) auto reduction (D) none of the above

Q.31 The flux used in the smelting of copper ores is
(A) lime stone (B) magnesia (C) silica (D) coke

Q.32 High purity copper metal is obtained by
(A) carbon reduction (B) hydrogen reduction (C) electrolytic reduction (D) thermite reduction

Q.33 Silica is added to roasted copper ores during smelting in order to remove
(A) cuprous sulphide (B) ferrous oxide (C) ferrous sulphide (D) cuprous oxide

Q.34 Roasting of copper pyrites is done
(A) to remove moisture and volatile impurities (B) to oxidise free sulphur
(C) to decompose pyrites into Cu_2S and FeS (D) for all the above

Q.35 In the electrolytic refining of copper, Ag and Au are found
(A) on cathode (B) on anode (C) in the anodic mud (D) in the cathodic mud

Q.36 In a transition series, as the atomic number increases, paramagnetism
(A) Increases gradually (B) Decreases gradually
(C) First increases to a maximum and then decreases
(D) First decreases to a minimum and then increases

Q.37 Sodium thiosulphate, $Na_2S_2O_3.5H_2O$ is used in photography to :
(A) Reduce the silver bromide grains to metallic silver
(B) Convert the metallic silver to silver salt
(C) remove undecomposed AgBr as soluble silver thiosulphate complex
(D) remove reduced silver

Q.38 When $AgNO_3$ comes in contact with skin, it leaves a black stain. This is because of
(A) HNO_3 produced by hydrolysis of $AgNO_3$ (B) AgOH produced by hydrolysis of $AgNO_3$
(C) Its reduction to silver (D) Its oxidation to silver oxide

Q.39 The element which is present in every amalgam is
(A) copper (B) Silver (C) Iron (D) Mercury

Q.40 Which of the following statements is incorrect?
(A) Mercurous ion exists as Hg^+
(B) Mercurous ion is diamagnetic and exists as dimer Hg_2^{2+}
(C) Mercurous ion is colourless
(D) There is a covalent bond between two Hg^+ ions.

Q.41 $CuSO_4$ solution + lime is called
(A) Luca's reagent (B) Bafoed's reagent (C) Fehling solution A (D) Bordeaux mixture

Q.42 Silver can be separated from lead by
(A) fractional crystallisation (B) amalgamation
(C) filteration (D) addition of zinc

Q.43 Red precipitate is obtained when silver nitrate is added to
(A) K_2CrO_4 (B) KI (C) KBr (D) $Na_2S_2O_3$

Q.44 Photographic films or plates have ..... as an essential ingredient
(A) silver oxide (B) silver bromide (C) silver thiosulphate (D) silver nitrate

Q.45 Silver nitrate is usually supplied in coloured bottles because it is
(A) oxidised in air (B) decomposes in sunlight
(C) explodes in sunlight (D) reacts with air in sunlight

Q.46 Disodium hydrogen phospahte in presence of NH_4Cl and NH_4OH gives a white ppt. with a solution of Mg^{2+} ion. The precipitate is :
(A)$Mg(H_2PO_4)_2$ (B) $Mg_3(PO_4)_2$ (C) $MgNH_4PO_4$ (D) $MgHPO_4$

Q.47 Verdigris is
(A) Basic copper acetate (B) Basic lead acetate (C) Basic lead (D) None

Q.48 Philosopher's wool when heated with BaO at 1100°C gives the compound
(A) $BaCdO_2$ (B) $Ba + ZnO_2$ (C) $BaO_2 + Zn$ (D) $BaZnO_2$

Q.49 Which of the following compound is used as a purgative?
(A) Cu_2Cl_2 (B) $CuCl_2$ (C) Hg_2Cl_2 (D) $HgCl_2$

Q.50 Zinc carbonate is precipiated from zinc sulphate solution by the addition of
(A) Na_2CO_3 (B) $CaCO_3$ (C) $MgCO_3$ (D) $NaHCO_3$

Q.51 On adding ammonium hydroxide solution to $Al_2(SO_4)_3$ (aq). :
(A) a precipitate is formed which does not dissolve in excess of ammonium hydroxide
(B) a precipitate is formed which dissolves in excess of ammonia solution
(C) no precipitate is formed (D) none

Q.52 Mercury on heating with aqua-regia gives
(A) $Hg(NO_3)_2$ (B) $HgCl_2$ (C) $Hg(NO_2)_2$ (D) Hg_2Cl_2

Q.53 The iron obtained from the blast furnace is called
(A) pig iron (B) cast iron (C) wrought iron (D) steel

Q.54 Stainless steel contains iron and
(A) Zn (B) Cu (C) Al (D) Cr

Q.55 Nitriding is a process of heating steel in atmosphere of
(A) ammonia (B) oxygen (C) carbon dioxide (D) air

Q.56 Rust is
(A) Fe_2O_3 (B) $FeO.xH_2O$ (C) $Fe_2O_3.xH_2O$ (D) $Fe_3O_4.xH_2O$

Q.57 When dry ammonia gas is passed over heated sodium (out of contact of air) the product formed is :
(A) sodium hydride (B) sodium nitride (C) sodamide (D) sodium cyanamide

Q.58 Crude common salt is hygroscopic because of impurities of
(A) $CaSO_4$ and $MgSO_4$ (B) $CaCl_2$ and $MgCl_2$
(C) $CaBr_2$ and $MgBr_2$ (D) $Ca(HCO_3)_2$ and $Mg(HCO_3)_2$

Q.59 Magnesium wire burns in the atmosphere of CO_2 because :
(A) magnesium acts as an oxidising agent
(B) magnesium has 2 electrons in the outermost orbit
(C) magnesium acts as a reducing agent and removes oxygen from CO_2
(D) none of the above

Q.60 The butter of tin is represent by
(A) $SnCl_2.5H_2O$ (B) $SnCl_2$ (C) $SnCl_4$ (D) $SnCl_4.5H_2o$

Q.61 Electrolytic bath in electrolytic refining of lead contains
(A) H_2SiF_6 only (B) $PbSiF_6$ only
(C) H_2SiF_6 in presence of gelatin (D) H_2SiF_6 and $PbSiF_6$ in presence of gelatin

Q.62 In Al_2Cl_6 , which statement is incorrect :
(A) Four Al–Cl bonds are of same length and two of different length
(B) Six Al – Cl bonds are of same length and two of different length
(C) The angle Cl – Al – Cl is 110^0 and 93^0 (D) The angle Al – Cl – Al is 87^0

Q.63 Gold dissolves in aqua- regia forming
(A) Auric chloride (B) Aurous chloride (C) Chloroauric acid (D) Aurous nitrate

Q.64 Oxygen is absorbed by molten Ag, which is evolved on cooling and the silver particles are scattered ; the phenomenon is known as:
(A) silvering of mirror (B) spitting of silver (C) frosting of silver (D) hairing of silver

Q.65 Which is formed when iron reacts with carbon:
(A) FeC_2 (B) Fe_3C (C) FeC_3 (D) Fe_2C

CHOOSE THE CORRECT OPTION. MORE THAN ONE ARE CORRECT

Q.1 When H_2S is passed through an ammonical salt solution of X, a black precipitate is formed. The X can be:
(A) cobalt salt (B) nickel salt (C) manganese salt (D) zinc salt

Q.2 Which of the following are soluble in excess of NaOH?
(A) $Al(OH)_3$ (B) $Cr(OH)_3$ (C) $Fe(OH)_3$ (D) $Zn(OH)_2$

Q.3 Which are interfering radicals?
(A) SO_4^{2-} (B) PO_4^{3-} (C) BO_3^{3-} (D) $C_2O_4^{2-}$

Q.4 A solution of a salt in HCl when diluted with water turns milky. It indicates the presence of :
(A) Zn (B) Bi (C) Fe (D) Sb

Q.5 Which statements about mercury are correct?
(A) Hg is a liquid metal (B) Hg forms two series of salts
(C) Hg forms no amalgam with iron and platinum (D) Hg does not show variable valency

Q.6 When excess of Sn(II) chloride solution is added to Hg (II) chloride solution, the substances formed are:
(A) Sn-amalgam (B) Hg_2Cl_2 (C) $SnCl_4$ (D) Hg

Q.7 Identify the correct statements:
(A) Fluorine is a super halogen (B) Iodine shows basic nature
(C) AgF is insoluble in water (D) SCN^- is the pseudohalide

Q.8 Which reactions are used for the preparation of the halogen acid?
(A) $2KBr + H_2SO_4 \longrightarrow K_2SO_4 + 2HBr$ (B) $CaF_2 + \underset{(conc.)}{H_2SO_4} \longrightarrow CaSO_4 + 2HF$
(C) $NaCl + \underset{(conc.)}{H_2SO_4} \longrightarrow NaHSO_4 + HCl$ (D) $NaHSO_4 + NaCl \longrightarrow Na_2SO_4 + HCl$

Q.9 Available chlorine is liberated from bleaching powder when it:
(A) is heated (B) reacts with acid (C) reacts with water (D) reacts with CO_2

Q.10 Which of the following gases on dissolution in water make the solution acidic?
(A) CO (B) CO_2 (C) SO_3 (D) PH_3

Q.11 Reducing property of sulphur dioxide is shown in the reactions:
(A) $2H_2S + SO_2 \longrightarrow 3S + 2H_2O$
(B) $5SO_2 + 2KMnO_{4+}\ 2H_2O \longrightarrow K_2SO_4 + 2MnSO_4 + 2H_2SO_4$
(C) $SO_2 + 2HNO_3 \longrightarrow H_2SO_4 + 2NO_2$ (D) $4Na + 3SO_2 \longrightarrow Na_2SO_3 + Na_2S_2O_3$

Q.12 Which statements are correct for ozone?
(A) It is obtained by silent electric discharge on oxygen
(B) It can be obtained by the action of ultraviolet rays on oxygen
(C) It is regarded as an allotrope of oxygen (D) Ozone molecule is paramagnetic like oxygen molecule

Q.13 Phosphine is obtained by the reaction when:
(A) white phosphorus is heated with NaOH (B) Ca_3P_2 reacts with water
(C) red phosphorus is heated with NaOH (D) phosphorus is heated in a current of hydrogen.

Q.14 At high temperatures, nitrogen directly combines with:
(A) Zn (B) Mg (C) Al (D) Fe

Q.15 The compounds obtained by heating of orthophosphoric acid are:
(A) metaphosphoric acid (B) pyrophosphoric acid (C) P_4O_6 (D) P_4O_{10}

Q.16 Which are used as refrigerant?
(A) NH_3 (B) CO_2 (C) CCl_2F_2 (D) CO

Q.17 Identify the correct statements regarding structure of diborane:
(A) there are two bridging hydrogen atoms (B) each boron atom forms four bonds
(C) the hydrogen atoms are not in the same plane (D) each boron atom is in sp^3 hybridized state

Q.18 Point out the correct statements:
(A) permanent hardness can be removed by boiling water
(B) temporary hardness is due to bicarbonates of calcium and magnesium
(C) permanent hardness is due to sulphates and chlorides of Ca and Mg
(D) hardness of water depends upon its soap consuming power

Q.19 Identify the correct statements:
(A) sodium carbonate on heating evolves carbon dioxide
(B) sodium nitrate on heating evolves nitrogen dioxide
(C) sodium hydroxide does not decompose on heating
(D) sodium bicarbonate on heating evolves carbon dioxide.

Q.20 Identify the correct statements:
(A) sodium can be prepared by electrolysing aqueous solution of NaCl
(B) sodium can be prepared by electrolysing fused NaCl
(C) sodium is a strong oxidising agent (D) sodium is soluble in liquid ammonia

Q.21 Which of the following compounds is(are) explosive(s)?
(A) NF_3 (B) NCl_3 (C) $NBr_3 \cdot NH_3$ (D) $NI_3 \cdot NH_3$

Q.22 If M represents Gr.13 element, the correct order of H–M–H bond angle is
(A) $NH_3 < PH_3 < AsH_3 < SbH_3$ (B) $SbH_3 < AsH_3 < PH_3 < NH_3$
(C) $NH_3 < PH_3 < SbH_3 < BiH_3$ (D) $BiH_3 < SbH_3 < AsH_3 < PH_3$

Q.23 Which of the following is true for N_2O?
(A) Its molecule is linear.
(B) Symmetric N–O–N is a favoured structure as compared to N–N–O skeleton.
(C) Bond orders are fractional for N–N and N–O bonds. (D) It is a neutral oxide.

Q.24 Which of the following is true for N_2O_5?
(A) It is obtained by carefully dehydrating HNO_3 with P_2O_5 (B) It is acidic oxide
(C) No N–N bond exists in $N_2O_5(g)$ (D) It is ionic in solid state as $NO_2^+NO_3^-$

Q.25 Which of the following species is (are) formed when conc. HNO_3 is added to conc. sulphuric acid.
(A) NO_3^- (B) NO_2^+ (C) NO^+ (D) HSO_4^-

Q.26 Which of the following will release CO_2 when heated to 1000^0C?
(A) $KHCO_3$ (B) Li_2CO_3 (C) K_2CO_3 (D) $PbCO_3$

Q.27 Which of the following will give N_2 when heated?
(A) NaN_3 (B) NH_4NO_2 (C) NH_4NO_3 (D) Mg_3N_2

Q.28 Which of the following precipitates dissolve in aqueous ammonia leaving no solid residue?
(A) $Cu(OH)_2$ (B) Ag_2SO_4 (C) $Ni(OH)_2$ (D) Hg_2Cl_2

Q.29 PH_3 can be obtained by
(A) heating hypophosphorus acid (B) heating orthophophorus acid
(C) reacting white phosphorus with hot conc. NaOH (D) hydrolysis of calcium phosphide

Q.30 Drops of nitric acid reacts with P_4O_{10} to give
(A) NO (B) NO_2 (C) N_2O_5 (D) HPO_3

Q.31 Nitrating mixture is obtained by mixing conc. HNO_3 and conc. H_2SO_4. Role of H_2SO_4 in nitration is
(A) to force HNO_3 to behave as a base (B) to supress the dissociation of HNO_3
(C) to produce NO_2^+ ions (D) to remove the color of NO_2 produced during nitration

Q.32 Which of the following, when dissolved in water, will liberate ammonia ?
(A) $NaNO_3$ (B) $NaNO_2$ (C) $NaNH_2$ (D) Na_3N (E) $LiNO_3$

MATCH THE COLUMN

Q.1

Column I	**Column II**
(A) Dithionous acid	(P) S–O–S bond is not present
(B) Thiosulphuric acid	(Q) All S atom in the molecule has oxidation state +3
(C) Caro's acid	(R) Acidic strength of all H atoms present in the molecule is different
(D) Pyrosulphurous acid	(S) at least one S atom has oxidation state +5 in molecule

Q.2

	Column I		**Column II**
(A)	XeF_5^+	(P)	Two lone pairs
(B)	ICl_4^-	(Q)	Planar
(C)	$TeCl_4$	(R)	Non-planar
(D)	I_3^+	(S)	sp^3d^2 (Hybridization of central atom)

Q.3 Select the option which correctly represents the order of Boiling points of given compounds.

Column I			**Column II**	
(A) H_2O	NH_3	HF	(P)	a > b > c
[a]	[b]	[c]		
(B) SbH_3	PH_3	AsH_3	(Q)	c > b > a
[a]	[b]	[c]		
(C) C_2H_6	C_3H_8	C_4H_{10}	(R)	b > a > c
[a]	[b]	[c]		
(D) CH_3OH	$CH_2(OH)-CH_2(OH)$	CH_3Cl	(S)	a > c > b
[a]	[b]	[c]		

ANSWER KEY

ONLY ONE OPTION IS CORRECT

Q.1	B	Q.2	A	Q.3	A	Q.4	A	Q.5	A	Q.6	A	Q.7	B
Q.8	C	Q.9	D	Q.10	B	Q.11	A	Q.12	A	Q.13	B	Q.14	B
Q.15	A	Q.16	A	Q.17	C	Q.18	A	Q.19	C	Q.20	D	Q.21	A
Q.22	A	Q.23	D	Q.24	B	Q.25	A	Q.26	B	Q.27	A	Q.28	C
Q.29	D	Q.30	C	Q.31	C	Q.32	C	Q.33	B	Q.34	D	Q.35	C
Q.36	C	Q.37	C	Q.38	C	Q.39	D	Q.40	A	Q.41	D	Q.42	D
Q.43	A	Q.44	B	Q.45	B	Q.46	C	Q.47	A	Q.48	D	Q.49	C
Q.50	D	Q.51	A	Q.52	B	Q.53	A	Q.54	D	Q.55	A	Q.56	C
Q.57	C	Q.58	B	Q.59	C	Q.60	D	Q.61	D	Q.62	A	Q.63	C
Q.64	B	Q.65	B										

CHOOSE THE CORRECT OPTION. MORE THAN ONE ARE CORRECT

Q.1	A,B	Q.2	A,B,D	Q.3	B,C,D	Q.4	A,B,D
Q.5	A,B,C,D	Q.6	B,C,D	Q.7	A,B,D	Q.8	B,C,D
Q.9	B,C,D	Q.10	B,C	Q.11	B,C	Q.12	A,B,C
Q.13	A,B	Q.14	B,C	Q.15	A,B,D	Q.16	A,B,C
Q.17	A,B,C,D	Q.18	B,C,D	Q.19	C,D	Q.20	B,D
Q.21	B,C,D	Q.22	B,D	Q.23	A,C,D	Q.24	A,B,C,D
Q.25	B,D	Q.26	A,B,D	Q.27	A,B	Q.28	A,B,C
Q.29	A,B,C,D	Q.30	C,D	Q.31	A,C	Q.32	C,D

MATCH THE COLUMN

Q.1 (A) P,Q; (B)P; (C) P,R; (D) P,R,S

Q.2 (A) R, S; (B) P, Q, S; (C) R; (D) P, Q

Q.3 (A) S, (B) S, (C) Q, (D) R

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INORGANIC CHEMISTRY

S-BLOCK ELEMENTS

S-BLOCK ELEMENTS

Q.1 Cs^+ ions impart violet colour to Bunsen flame. This is due to the fact that the emitted radiations are of
(A) high energy (B) lower frequencies (C) longer wave-lengths (D) zero wave number

Q.2 The compound(s) of alkaline earth metals, which are amphoteric in nature is/are
(A) BeO (B) MgO (C) $Be(OH)_2$ (D) $Mg(OH)_2$

Q.3 An alkaline earth metal (M) gives a salt with chlorine, which is soluble in water at room temperature. It also forms an insoluble sulphate whose mixture with a sulphide of a transition metal is called 'lithopone' -a white pigment. Metal M is
(A) Ca (B) Mg (C) Ba (D) Sr

Q.4 The reaction of an element A with water produces combustible gas B and an aqueous solution of C. When another substance D reacts with this solution C also produces the same gas B. D also produces the same gas even on reaction with dilute H_2SO_4 at room temperature. Element A imparts golden yellow colour to Bunsen flame. Then, A, B, C and D may be identified as
(A) Na, H_2, NaOH and Zn (B) K, H_2, KOH and Zn
(C) K, H_2, NaOH and Zn (D) Ca, H_2, $CaCOH_2$ and Zn

Q.5 The hydroxide of alkaline earth metal, which has the lowest value of solubility product (K_{sp}) at normal temperature (25°C) is
(A) $Ca(OH)_2$ (B) $Mg(OH)_2$ (C) $Sr(OH)_2$ (D) $Be(OH)_2$

Q.6 The correct statement is/are
(A) $BeCl_2$ is a covalent compound (B) $BeCl_2$ is an electron deficient molecule
(C) $BeCl_2$ can form dimer (D) the hybrid state of Be in $BeCl_2$ is sp^2

Q.7 $(\text{Yellow ppt})\,T \xleftarrow{K_2CrO_4/H^+} X \xrightarrow{\text{dil.HCl}} Y(\text{Yellow ppt}) + Z\uparrow (\text{pungent smelling gas})$
If X gives green flame test. Then, X is
(A) $MgSO_4$ (B) BaS_2O_3 (C) $CuSO_4$ (D) PbS_2O_3

Q.8 Which of the following carbonate of alkali metals has the least thermal stability?
(A) Li_2CO_3 (B) K_2CO_3 (C) Cs_2CO_3 (D) Na_2CO_3

Q.9 The 'milk of magnesia' used as an antacid is chemically
(A) $Mg(OH)_2$ (B) MgO (C) $MgCl_2$ (D) $MgO + MgCl_2$

Q.10 The alkali metals which form normal oxide, peroxide as well as super oxides are
(A) Na, Li (B) K, Li (C) Li, Cs (D) K, Rb

Q.11 The pair of compounds, which cannot exist together in a solution is
(A) $NaHCO_3$ and NaOH (B) Na_2CO_3 and NaOH
(C) $NaHCO_3$ and Na_2CO_3 (D) $NaHCO_3$ and H_2O

Q.12 $Mg_2C_3 + H_2O \longrightarrow$ X (organic compound). Compound X is
(A) C_2H_2 (B) CH_4 (C) propyne (D) ethene

Q.13 The hydration energy of Mg^{2+} is
(A) more than that of Mg^{3+} ion (B) more than that of Na^+ ion
(C) more than that of Al^{3+} ion (D) more than that of Be^{2+} ion

Q.14 The golden yellow colour associated with NaCl to Bunsen flame can be explained on the basis of
(A) low ionisation potential of sodium (B) emission spectrum
(C) photosensitivity of sodium (D) sublimation of metallic sodium of yellow vapours

Q.15 Solution of sodium metal in liquid ammonia is a strong reducing agent due to presence of
(A) solvated sodium ions (B) solvated hydrogen ions
(C) sodium atoms or sodium hydroxide (D) solvated electrons

Q.16 The order of solubility of lithium halides in non-polar solvents follows the order
(A) LiI > LiBr > LiCl > LiF (B) LiF > LiI > LiBr > LiCl
(C) LiCl > LiF > LiI > LiBr (D) LiBr > LiCl > LiF > LiI

Q.17 The salt which finds uses in qualitative inorganic analysis is
(A) $CuSO_4 \cdot 5H_2O$ or $ZnSO_4 \cdot 5H_2O$ (B) $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$
(C) $Na(NH_4)HPO_4 \cdot 4H_2O$ (D) $FeSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O$

Q.18 Fire extinguishers contain
(A) conc. H_2SO_4 solution (B) H_2SO_4 and $NaHCO_3$ solutions
(C) $NaHCO_3$ solution (D) $CaCO_3$ solution

Q.19 $CsBr_3$ contains
(A) Cs–Br covalent bonds (B) Cs^{3+} and Br^- ions
(C) Cs^+ and Br_3^- ions (D) Cs^{3+} and Br_3^{3-} ions

Q.20 KO_2 finds use in oxygen cylinders used for space and submarines. The fact(s) related to such use of KO_2 is/are
(A) it produces O_2 (B) it produces O_3
(C) it absorbs CO_2 (D) it absorbs both CO and CO_2

Q.21 The compound(s) which have –O–O– bond(s) is/are
(A) BaO_2 (B) Na_2O_2 (C) CrO_5 (D) Fe_2O_3

Q.22 $Na + Al_2O_3 \xrightarrow{\text{High temperature}} X \xrightarrow[\text{water}]{CO_2 \text{ in}} Y$; compound Y is
(A) $NaAlO_2$ (B) $NaHCO_3$ (C) Na_2CO_3 (D) Na_2O_2

Q.23 The correct order of second ionisation potentials (IP) of Ca, Ba and K is
(A) K > Ca > Ba (B) Ba > Ca > K (C) K > Ba > Ca (D) K = Ba = Ca

Q.24 EDTA is used in the estimation of
(A) Mg^{2+} ions (B) Ca^{2+} ions
(C) both Ca^{2+} and Mg^{2+} ions (D) Mg^{2+} ions but not Ca^{2+} ions

Q.25 Highly pure dilute solution of sodium in ammonia
(A) shows blue colouration due to solvated electrons
(B) shows electrical conductivity due to both solvated electrons as well as solvated sodium ions
(C) shows red colouration due to solvated electrons but a bad conductor of electricity
(D) produces hydrogen gas or carbonate

Q.26 aq. $NaOH + P_4$ (white) $\longrightarrow PH_3 + X$; compound X is
(A) NaH_2PO_2 (B) $NaHPO_4$ (C) Na_2CO_3 (D) $NaHCO_3$

Q.27 The correct order of solubility is
(A) $CaCO_3 < KHCO_3 < NaHCO_3$ (B) $KHCO_3 < CaCO_3 < NaHCO_3$
(C) $NaHCO_3 < CaCO_3 < KHCO_3$ (D) $CaCO_3 < NaHCO_3 < KHCO_3$

Q.28 The complex formation tendency of alkaline earth metals decreases down the group because
(A) atomic size increases (B) availability of empty d and f-orbitals increases
(C) nuclear charge to volume ratio increases (D) all the above

Q.29 The alkaline earth metals, which do not impart any colour to Bunsen flame are
(A) Be and Mg (B) Mg and Ca (C) Be and Ca (D) Be and Ba

Q.30 $Y \xleftarrow{\Delta, 205°C} CaSO_4 \cdot 2H_2O \xrightarrow{\Delta, 120°C} X$. X and Y are respectively
(A) plaster of paris, dead burnt plaster (B) dead burnt plaster, plaster of paris
(C) CaO and plaster of paris (D) plaster of paris, mixture of gases

Q.31 A metal M readily forms water soluble sulphate, and water insoluble hydroxide $M(OH)_2$. Its oxide MO is amphoteric, hard and having high melting point. The alkaline earth metal M must be
(A) Mg (B) Be (C) Ca (D) Sr

Q.32 When K_2O is added to water, the solution becomes basic in nature because it contains a significant concentration of
(A) K^+ (B) O^{2-} (C) OH^- (D) O_2^{2-}

Q.33 $(\text{White ppt}) D \xleftarrow{Na_2CO_3} A \xrightarrow[(\text{in acetic acid})]{K_2CrO_4} B(\text{Yellow ppt})$

$\text{dil.} H_2SO_4 \downarrow$

$C(\text{White ppt})$

If A is the metallic salt, then the white ppt. of D must be of
(A) stronsium carbonate (B) red lead (C) barium carbonate (D) calcium carbonate

Q.34 $(\text{Milky Cloud}) C \xleftarrow{CO_2} A + Na_2CO_3 \longrightarrow B + C$
The chemical formulae of A and B are
(A) NaOH and $Ca(OH)_2$ (B) $Ca(OH)_2$ and NaOH
(C) NaOH and CaO (D) CaO and $Ca(OH)_2$

Q.35 An aqueous solution of an halogen salt of potassium reacts with same halogen X_2 to give KX_3, a brown coloured solution, in which halogen exists as X_3^- ion, X_2 as a Lewis acid and X^- as a Lewis base, halogen X is
(A) chlorine (B) bromine (C) iodine (D) fluorine

Q.36 The correct order of basic-strength of oxides of alkaline earth metals is
(A) BeO > MgO > CaO > SrO (B) SrO > CaO > MgO > BeO
(C) BeO > CaO > MgO > SrO (D) SrO > MgO > CaO > BeO

Q.37 Which of the following compounds are paramagnetic in nature?
(A) KO_2 (B) K_2O_2 (C) Na_2O_2 (D) RbO_2

Q.38 The order of melting point of chlorides of alkali metals is
(A) LiCl > NaCl > KCl < CsCl (B) LiCl > NaCl > KCl > CsCl
(C) NaCl > KCl > CsCl > LiCl (D) LiCl > NaCl > CsCl > KCl

Q.39 $NaOH(\text{Solid}) + CO \xrightarrow{200°C} X$; product X is
(A) $NaHCO_3$ (B) Na_2CO_3 (C) HCOONa (D) H_2CO_3

Q.40 $X \xrightarrow{N_2,\Delta} Y \xrightarrow{H_2O} Z(\text{colourless gas}) \xrightarrow[CuSO_4]{} T(\text{blue colour})$

Then, substances Y and T are
(A) $Y = Mg_3N_2$ and $T = CuSO_4 \cdot 5H_2O$ (B) $Y = Mg_3N_2$ and $T = CuSO_4 \cdot 4NH_3$
(C) $Y = Mg(NO_3)_2$ and T = CuO (D) Y = MgO and $T = CuSO_4 \cdot 4NH_3$

Q.41 Weakest base among KOH, NaOH, $Ca(OH)_2$ and $Zn(OH)_2$ is
(A) $Ca(OH)_2$ (B) KOH (C) NaOH (D) $Zn(OH)_2$

Q.42 If X and Y are the second ionisation potentials of alkali and alkaline earth metals of same period, then
(A) X > Y (B) X < Y (C) X = Y (D) X << Y

Q.43 The aqueous solutions of lithium salts are poor conductor of electricity rather than other alkali metals because of
(A) high ionisation energy
(B) high electronegativity
(C) lower ability of Li^+ ions to polarize water molecules
(D) higher degree of hydration of Li^+ ions

Q.44 Sodium metal is highly reactive and cannot be stored under
(A) toluene (B) kerosene oil (C) alcohol (D) benzene

Q.45 Which of the following substance(s) is/are used in laboratory for drying purposes?
(A) anhydrous P_2O_5 (B) graphite (C) anhydrous $CaCl_2$ (D) Na_3PO_4

Q.46 Nitrogen dioxide cannot be prepared by heating
(A) KNO_3 (B) $AgNO_3$ (C) $Pb(NO_3)_2$ (D) $Cu(NO_3)_2$

Q.47 In $LiAlH_4$, metal Al is present in
(A) anionic part (B) cationic part
(C) in both anionic and cationic part (D) neither in cationic nor in anionic part

Q.48 $X \xrightarrow{CoCl_2} CaCl_2 + Y\uparrow$; the effective ingredient of X is
(A) OCl^- (B) Cl^- (C) OCl^+ (D) OCl_2^-

Q.49 Which one of the following fluoride of alkali metals has the highest lattice energy?
(A) LiF (B) CsF (C) NaF (D) KF

Q.50 Crown ethers and cryptands form
(A) complexes with alkali metals
(B) salts of alkali metals
(C) hydroxides of alkali metals used for inorganic quantitative analysis
(D) organic salts of alkali metals

Q.51 White heavy precipitates are formed when $BaCl_2$ is added to a clear solution of compound A. Precipitates are insoluble in dilute HCl. Then, the compound A is
(A) a bicarbonate (B) a carbonate (C) a sulphate (D) a chloride

Q.52 Among $MgCl_2$, RbCl, $BeCl_2$ and LiCl, the compouds with the highest and the lowest % of ionic characters are
(A) $MgCl_2$ and $BeCl_2$ (B) RbCl and $BeCl_2$ (C) $BeCl_2$ and $MgCl_2$ (D) RbCl and LiCl

Q.53 $X + C + Cl_2 \xrightarrow[\text{of about } 1000\,K]{\text{High temperature}} Y + CO$; $Y + 2H_2O \rightarrow Z + 2HCl$

Compound Y is found in polymeric chain structure and is an electron deficient molecule. Y must be

(A) BeO (B) $BeCl_2$ (C) BeH_2 (D) $AlCl_3$

Q.54 The correct order of degree of hydration of M^+ ions of alkali metals is

(A) $Li^+ < K^+ < Na^+ < Rb^+ < Cs^+$ (B) $Li^+ < Na^+ < K^+ < Rb^+ < Cs^+$

(C) $Cs^+ < Rb^+ < K^+ < Na^+ < Li^+$ (D) $Cs^+ < Rb^+ < Na^+ < K^+ < Li^+$

Q.55 $BeCl_2 + LiAlH_4 \longrightarrow X + LiCl + AlCl_3$

(A) X is LiH (B) X is BeH_2

(C) X is $BeCl_2 \cdot 2H_2O$ (D) none

Q.56 The order of thermal stability of carbonates of IIA group is

(A) $BaCO_3 > SrCO_3 > CaCO_3 > MgCO_3$ (B) $MgCO_3 > CaCO_3 > SrCO_3 > BaCO_3$

(C) $CaCO_3 > SrCO_3 > BaCO_3 > MgCO_3$ (D) $MgCO_3 = CaCO_3 > SrCO_3 = BaCO_3$

Q.57 A pair of substances which gives the same products on reaction with water is

(A) Mg and MgO (B) Sr and SrO (C) Ca and CaH_2 (D) Be and BeO

Q.58 Na_2SO_4 is water soluble but $BaSO_4$ is insoluble because

(A) the hydration energy of Na_2SO_4 is higher than that of its lattice energy

(B) the hydration energy of Na_2SO_4 is less than that of its lattice energy

(C) the hydration energy of $BaSO_4$ is less than that of its lattice energy

(D) the hydration energy of $BaSO_4$ is higher than that of its lattice energy

Q.59 Which of the following is not a anomalous property of lithium?

(A) Hydrated lithium ion is the largest among alkali metals

(B) The melting and boiling points of lithium are comparatively high

(C) Lithium is softer than that of other alkali metals

(D) The ionisation potential and electronegativity of lithium are higher than those of other alkali metals

Q.60 The incorrect statement(s) is/are

(A) Mg cannot form complexes

(B) Be can form complexes due to a very small atomic size

(C) the first ionisation potential of Be is higher than that of Mg

(D) Mg forms an alkaline hydroxide while Be forms amphoteric oxides

Q.61 The commercial method of preparation of potassium by reduction of molten KCl with metallic sodium at 850°C is based on the fact that

(A) potassium is solid and sodium distils off at 850 °C

(B) potassium being more volatile and distils off thus shifting the reaction forward

(C) sodium is more reactive than potassium at 850 °C

(D) sodium has less affinity to chloride ions in the presence of potassium ion

Q.62 $Be_2C + H_2O \longrightarrow BeO + X$

$CaC_2 + H_2O \longrightarrow Ca(OH)_2 + Y$; then X and Y are respectively

(A) CH_4, CH_4 (B) CH_4, C_2H_6 (C) CH_4, C_2H_2 (D) C_2H_2, CH_4

Q.63 Which of the following statements are false?

(A) $BeCl_2$ is a linear molecule in the vapour state but it is polymeric in the solid state

(B) Calcium hydride is called hydrolith.

(C) Carbides of both Be and Ca react with water to form acetylene

(D) Oxides of both Be and Ca are amphoteric.

Q.64 Which of the following are ionic carbides?
(A) CaC_2 (B) Al_4C_3 (C) SiC (D) Be_2C

Q.65 Which of the following groups of elements have chemical properties that are most similar
(A) Na, K, Ca (B) Mg, Sr, Ba (C) Be, Al, Ca (D) Be, Ra, Cs

Q.66 $MgBr_2$ and MgI_2 are soluble in acetone because of
(A) Their ionic nature (B) Their coordinate nature
(C) Their metallic nature (D) Their covalent nature

Q.67 Which of the following is not the characteristic of barium?
(A) It emits electrons on exposure to light
(B) It is a silvery white metal
(C) It forms $Ba(NO_3)_2$ which is used in preparation of green fire
(D) Its ionization potential is lower than radium.

Question No. 68 to 74

Questions given below consist of two statements each printed as Assertion (A) and Reason (R); while answering these questions you are required to choose any one of the following four responses:
(A) if both (A) and (R) are true and (R) is the correct explanation of (A)
(B) if both (A) and (R) are true but (R) is not correct explanation of (A)
(C) if (A) is true but (R) is false
(D) if (A) is false and (R) is true

Q.68 **Assertion** : Beryllium does not impart any characteristic colour to the bunsen flame.
Reason : Due to its very high ionization energy, beryllium requires a large amount of energy for exciation of the electrons.

Q.69 **Assertion** : In fused state, calcium chloride cannot be used to dry alcohol or NH_3.
Reason : $CaCl_2$ is not a good desiccant.

Q.70 **Assertion** : Diagonal relationship is shown between Be and Al.
Reason : Ionization potential of Be is almost the same as that of Al.

Q.71 **Assertion** : Beryllium halides dissolve in organic solvents.
Reason : Beryllium halides are ionic in character.

Q.72 **Assertion** : $BeCl_2$ fumes in moist air.
Reason : $BeCl_2$ reacts with moisture to form HCl gas.

Q.73 **Assertion** : Calcium carbide on hydrolysis gives methane.
Reason : Calcium carbide contains C_2^{2-} anion.

Q.74 **Assertion** : When CO_2 is passed through lime water, it first turns milky and then the solution becomes clear when the passage of CO_2 is continued.
Reason : The milkiness is due to the formation of insoluble $CaCO_3$ which then changes to soluble $Ca(HCO_3)_2$ when excess of CO_2 is present.

Q.75 **Assertion** : $MgCO_3$ is soluble in water when a current of CO_2 is passed.
Reason : The solubility of $MgCO_3$ is due to the formation of $Mg(HCO_3)_2$.

ANSWER KEY

Q.1	A	Q.2	A,C	Q.3	C	Q.4	A	Q.5	D
Q.6	A,B,C	Q.7	B	Q.8	A	Q.9	A	Q.10	D
Q.11	A	Q.12	C	Q.13	B	Q.14	A	Q.15	D
Q.16	A	Q.17	C	Q.18	B	Q.19	C	Q.20	A,C
Q.21	A,B,C	Q.22	C	Q.23	A	Q.24	C	Q.25	A,B
Q.26	A	Q.27	D	Q.28	A	Q.29	A	Q.30	A
Q.31	B	Q.32	C	Q.33	C	Q.34	B	Q.35	C
Q.36	B	Q.37	A,D	Q.38	C	Q.39	C	Q.40	B
Q.41	D	Q.42	A	Q.43	D	Q.44	C	Q.45	A,C
Q.46	A	Q.47	A	Q.48	A	Q.49	A	Q.50	A
Q.51	C	Q.52	B	Q.53	B	Q.54	C	Q.55	B
Q.56	A	Q.57	C	Q.58	A,C	Q.59	C	Q.60	A
Q.61	B	Q.62	C	Q.63	C,D	Q.64	A,B,D	Q.65	B
Q.66	D	Q.67	A	Q.68	A	Q.69	C	Q.70	A
Q.71	C	Q.72	A	Q.73	D	Q.74	A	Q.75	A

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INORGANIC CHEMISTRY

SALT ANALYSIS

QUESTION BANK ON SALT ANALYSIS

There are 102 questions in this question bank.

Select the correct alternative : (Only one is correct)

Q.1 In the precipitation of the iron group in qualitative analysis, ammonium chloride is added before adding ammonium hydroxide to

(A) decrease concentration of OH^- ions. (B) prevent interference by phosphate ions.

(C) increase concentration of Cl^- ions. (D) increase concentration of NH_4^+ ions.

Q.2 A salt gives violet vapours when treated with conc. H_2SO_4, it contains

(A) Cl^- (B) I^- (C) Br^- (D) NO_3^-

Q.3 The acidic solution of a salt produced a deep blue colour with starch iodide solution. The salt may be

(A) chloride (B) nitrite (C) acetate (D) bromide

Q.4 When a mixture of solid NaCl, solid $K_2Cr_2O_7$ is heated with conc. H_2SO_4, orange red vapours are obtained. These are of the compound

(A) chromous chloride (B) chromyl chloride

(C) chromic chloride (D) chromic sulphate

Q.5 Which of the following pairs of ions would be expected to form precipitate when dilute solution are mixed?

(A) Na^+, SO_4^{2-} (B) NH_4^+, CO_3^{2-} (C) Na^+, S_2^{2-} (D) Fe^{3+}, PO_4^{3-}

Q.6 Nessler's reagent is

(A) K_2HgI_4 (B) $K_2HgI_4 + KOH$ (C) $K_2HgI_2 + KOH$ (D) $K_2HgI_4 + KI$

Q.7 When bismuth chloride is poured into a large volume of water the white precipitate produced is

(A) $Bi(OH)_3$ (B) Bi_2O_3 (C) BiOCl (D) Bi_2OCl_3

Q.8 Ferric ion forms a prussian blue coloured ppt. of

(A) $K_4[Fe(CN)_6]$ (B) $Fe_4[Fe(CN)_6]_3$ (C) $KMnO_4$ (D) $Fe(OH)_3$

Q.9 A mixture, on heating with conc. H_2SO_4 and MnO_2, librates brown vapour of

(A) Br_2 (B) NO_2 (C) HBr (D) I_2

Q.10 Which one of the following can be used in place of NH_4Cl for the identification of the third group radicals?

(A) NH_4NO_3 (B) $(NH_4)_2SO_4$ (C) $(NH_4)_2S$ (D) $(NH_4)_2CO_3$

Q.11 At the occasion of marriage, the fire works are used, which of the following gives green flame?

(A) Ba (B) K (C) Be (D) Na

Q.12 Nitrate is confirmed by ring test. The brown colour of the ring is due to formation of

(A) ferrous nitrite (B) nitroso ferrous sulphate

(C) ferrous nitrate (D) $FeSO_4NO_2$

Q.13 $Fe(OH)_3$ can be separated from $Al(OH)_3$ by addition of
(A) dil. HCl (B) NaCl solution (C) NaOH solution (D) NH_4Cl and NH_4OH

Q.14 If NaOH is added to an aqueous solution of zinc ions a white ppt appears and on adding excess NaOH, the ppt dissolves. In this solution zinc exist in the
(A) cationic part (B) anionic part
(C) both in cationic and anionic parts (D) there is no zinc ion in the solution

Q.15 Mark the compound which is soluble in hot water.
(A) Lead chloride (B) Mercurous chloride (C) Stronsium sulphate (D) Silver chloride

Q.16 Colour of nickel chloride solution is
(A) pink (B) black (C) colourless (D) green

Q.17 Sometimes yellow turbidity appears while passing H_2S gas even in the absence of II group radicals. This is because of
(A) sulphur is present in the mixture as impurity.
(B) IV group radicals are precipitated as sulphides.
(C) the oxidation of H_2S gas by some acid radicals.
(D) III group radicals are precipitated as hydroxides.

Q.18 The ion that cannot be precipitated by H_2S and HCl is
(A) Pb^{2+} (B) Cu^{2+} (C) Ag^{+} (D) Ni^{2+}

Q.19 In V group, $(NH_4)_2CO_3$ is added to precipitate out the carbonates. We do not add Na_2CO_3 along with NH_4Cl because
(A) $CaCO_3$ is soluble in Na_2CO_3.
(B) Na_2CO_3 increases the solubility of V group carbonate.
(C) $MgCO_3$ will be precipitated out in V group.
(D) None of these

Q.20 $CuSO_4$ decolourises on addition of excess KCN, the product is
(A) $[Cu(CN)_4]^{2-}$. (B) Cu^{2+} get reduced to form $[Cu(CN)_4]^{3-}$
(C) $Cu(CN)_2$ (D) CuCN

Q.21 Which of the following cations is detected by the flame test?
(A) NH_4^+ (B) K^+ (C) Mg^{2+} (D) Al^{3+}

Q.22 Which one among the following pairs of ions cannot be separated by H_2S in dilute HCl?
(A) Bi^{3+}, Sn^{4+} (B) Al^{3+}, Hg^{2+} (C) Zn^{2+}, Cu^{2+} (D) Ni^{2+}, Cu^{2+}

Q.23 A metal salt solution gives a yellow ppt with silver nitrate. The ppt dissolves in dil. nitric acid as well as in ammonium hydroxide. The solution contains
(A) bromide (B) iodide (C) phosphate (D) chromate

Q.24 A metal salt solution forms a yellow ppt with potassium chromate in acetic acid, a white ppt with dilute sulphuric acid, but gives no ppt with sodium chloride or iodide, it is :
(A) lead carbonate (B) basic lead carbonate
(C) barium nitrate (D) strontium nitrate

Q.25 Which is soluble in NH_4OH?
(A) $PbCl_2$ (B) AgCl (C) $PbSO_4$ (D) $CaCO_3$

Q.26 Which of the following combines with Fe(II) ions to form a brown complex
(A) N_2O (B) NO (C) N_2O_3 (D) N_2O_4

Q.27 Nessler's reagent is used to detect
(A) CrO_4^{2-} (B) PO_4^{3-} (C) MnO_4^- (D) NH_4^+

Q.28 Prussian blue is formed when
(A) ferrous sulphate reacts with $FeCl_3$. (B) ferric sulphate reacts with $K_4[Fe(CN)_6]$.
(C) Ammonium sulphate reacts with $FeCl_3$ (D) ferrous ammonium sulphate reacts with $FeCl_3$

Q.29 What product is formed by mixing the solution of $K_4[Fe(CN)_6]$ with the solution of $FeCl_3$?
(A) Ferro-ferricyanide (B) Ferri-ferrocyanide (C) Ferri-ferricyanide (D) None of these

Q.30 Which of the following will not give positive chromyl chloride test?
(A) Copper chloride, $CuCl_2$ (B) Mercuric chloride, $HgCl_2$
(C) Zinc chloride, $ZnCl_2$ (D) Anillinium chloride, $C_6H_5NH_3Cl$

Q.31 A blue colouration is not obtained when
(A) ammonium hydroxide dissolves in copper sulphate.
(B) copper sulphate solution reacts with $K_4[Fe(CN)_6]$.
(C) ferric chloride reacts with sodium ferrocyanide.
(D) anhydrous white $CuSO_4$ is dissolved in water.

Q.32 AgCl dissolves in ammonia solution giving
(A) Ag^+, NH_4^+ and Cl^- (B) $Ag(NH_3)^+$ and Cl^-
(C) $Ag_2(NH_3)^{2-}$ and Cl^- (D) $Ag(NH_3)_2^+$ and Cl^-

Q.33 A white crystalline substance dissolves in water. On passing H_2S gas in this solution, a black ppt is obtained. The black ppt dissolves completely in hot HNO_3. On adding a few drops of conc. H_2SO_4, a white ppt is obtained. This ppt is that of
(A) $BaSO_4$ (B) $SrSO_4$ (C) $PbSO_4$ (D) $CdSO_4$

Q.34 When excess of $SnCl_2$ is added to a solution of $HgCl_2$, a white ppt turning grey is obtained. The grey colour is due to the formation of
(A) Hg_2Cl_2 (B) $SnCl_4$ (C) Sn (D) Hg

Q.35 Of the following sulphides which one is insoluble in dil. acids but soluble in alkalies.
(A) PbS (B) CdS (C) FeS (D) As_2S_3

Q.36 When chlorine water is added to an aqueous solution of potassium halide in presence of chloroform, a violet colour is obtained. On adding more of chlorine water, the violet colour disappears, and a colourless solution is obtained. This test confirms the presence of the following in aqueous solution
(A) Iodide (B) Bromide (C) Chloride (D) Iodide and bromide

Q.37 An aqueous solution of colourless metal sulphate M, gives a white ppt, with NH_4OH. This was soluble in excess of NH_4OH. On passing H_2S through this solution a white ppt is formed. The metal M in the salt is
(A) Ca (B) Ba (C) Al (D) Zn

Q.38 When $AgNO_3$ is strongly heated, the products formed are
(A) NO and NO_2 (B) NO_2 and O_2 (C) NO_2 and N_2O (D) NO and O_2

Q.39 AgCl is soluble in
(A) Aqua regia (B) H_2SO_4 (C) dil. HCl (D) aq. NH_3

Q.40 A substance on treatment with dil. H_2SO_4 liberates a colourless gas which produces (i) turbidity with baryta water and (ii) turns acidified dichromate solution green. The reaction indicates the presence of
(A) CO_3^{2-} (B) S^{2-} (C) SO_3^{2-} (D) NO_2^-

Q.41 When copper nitrate is strongly heated, it is converted into
(A) Cu metal (B) cupric oxide (C) cuprous oxide (D) copper nitrate

Q.42 A white solid is first heated with dil H_2SO_4 and then with conc. H_2SO_4. No action was observed in either case. The solid salt contains
(A) sulphide (B) sulphite (C) thiosulphate (D) sulphate

Q.43 A pale green crystalline metal salt of M dissolves freely in water. On standing it gives a brown ppt on addition of aqueous NaOH. The metal salt solution also gives a black ppt on bubbling H_2S in basic medium. An aqueous solution of the metal salt decolourizes the pink colour of the permanganate solution. The metal in the metal salt solution is
(A) copper (B) aluminium (C) lead (D) iron

Q.44 On the addition of a solution containing CrO_4^{2-} ions to the solution of Ba^{2+}, Sr^{2+} and Ca^{2+} ions, the ppt obtained first will be of
(A) $CaCrO_4$ (B) $SrCrO_4$ (C) $BaCrO_4$ (D) a mixture of all the three

Q.45 Turnbull's blue is a compound
(A) ferricyanide (B) ferro ferricyanide (C) ferrous cyanide (D) ferriferrocyanide

Q.46 Sodium borate on reaction with conc. H_2SO_4 and C_2H_5OH gives a compound A which burns with a green edged flame. The compound A is
(A) $H_2B_4O_7$ (B) $(C_2H_5)_2B_4O_7$ (C) H_3BO_3 (D) $(C_2H_5)_3BO_3$

Q.47 When $K_2Cr_2O_7$ crystals are heated with conc. HCl, the gas evolved is
(A) O_2 (B) Cl_2 (C) CrO_2Cl_2 (D) HCl

Q.48 Which is most soluble in water?
(A) AgCl (B) AgBr (C) AgI (D) AgF

Q.49 On passing H_2S gas in II group sometimes the solution turns milky. It indicates the presence of
(A) oxidising agent (B) acidic salt (C) thiosulphate (D) reducing agent.

Q.50 Dimethyl glyoxime in a suitable solvent was refluxed for 10 minutes with pure pieces of nickel sheet, it will result in
(A) Red ppt (B) Blue ppt. (C) Yellow ppt. (D) No ppt.

Q.51 A mixture of chlorides of copper, cadmium, chromium, iron and aluminium was dissolved in water acidified with HCl and hydrogen sulphide gas was passed for sufficient time. It was filtered, boiled and a few drops of nitric acid were added while boiling. To this solution ammonium chloride and sodium hydroxide were added in excess and filtered. The filtrate shall give test for
(A) sodium and iron
(B) sodium, chromium and aluminium
(C) aluminium and iron
(D) sodium, iron, cadmium and aluminium

Q.52 A metal is brunt in air and the ash on moistening smells of ammonia. The metal is
(A) Na (B) Fe (C) Mg (D) Al

Q.53 Solution of chemical compound X reacts with $AgNO_3$ solution to form a white ppt. Y which dissolves in NH_4OH to give a complex Z. When Z is treated with dil. HNO_3, Y reappears. The chemical compound X can be
(A) NaCl (B) CH_3Cl (C) NaBr (D) NaI

Q.54 A white ppt obtained in a analysis of a mixture becomes black on treatment with NH_4OH. It may be
(A) $PbCl_2$ (B) AgCl (C) $HgCl_2$ (D) Hg_2Cl_2

Q.55 A salt on treatment with dil. HCl gives a pungent smelling gas and a yellow precipitate. The salt gives green flame when tested. The solution gives a yellow precipitate with potassium chromate. The salt is:
(A) $NiSO_4$ (B) BaS_2O_3 (C) PbS_2O_3 (D) $CuSO_4$

Q.56 Which compound does not dissolve in hot dilute HNO_3?
(A) HgS (B) PbS (C) CuS (D) CdS

Q.57 An aqueous solution of $FeSO_4$, $Al_2(SO_4)_3$ and chrome alum is heated with excess of Na_2O_2 and filtered. The materials obtained are:
(A) a colourless filtrate and a green residue.
(B) a yellow filtrate and a green residue.
(C) a yellow filtrate and a brown residue.
(D) a green filtrate and a brown residue.

Q.58 Which of the following compound on reaction with NaOH and Na_2O_2 gives yellow colour?
(A) $Cr(OH)_3$ (B) $Zn(OH)_2$ (C) $Al(OH)_3$ (D) None of these

Q.59 CrO_3 dissolves in aqueous NaOH to give:
(A) $Cr_2O_7^{2-}$ (B) CrO_4^{2-} (C) $Cr(OH)_3$ (D) $Cr(OH)_2$

Q.60 $B(OH)_3 + NaOH \rightarrow NaBO_2 + Na[B(OH)_4] + H_2O$
How can this reaction is made to proceed in forward direction?
(A) addition of cis 1,2 diol
(B) addititon of borax
(C) addition of trans 1,2 diol
(D) addition of Na_2HPO_4

Q.61 A solution when diluted with H_2O and boiled, it gives a white precipitate. On addition of excess NH_4Cl/NH_4OH the volume of precipitate decreases leaving behind a white gelatinous precipitate. Identify the precipitate which dissolves in NH_4OH/NH_4Cl
(A) $Zn(OH)_2$ (B) $Al(OH)_3$ (C) $Mg(OH)_2$ (D) $Ca(OH)_2$

Q.62 An aqueous solution of a substance gives a white ppt. on treatment with dil. HCl, which dissolves on heating. When hydrogen sulphide is passed through the hot acidic solution, a black ppt. is obtained. The substance is a
(A) Hg^{2+} salt (B) Cu^{2+} salt (C) Ag^{+} salt (D) Pb^{2+} salt

Q.63 Which of the following does not react with AgCl?
(A) Na_2CO_3 (B) $NaNO_3$ (C) NH_4OH (D) $Na_2S_2O_3$

Q.64 Which one of the following does not produce metallic sulphide with H_2S?
(A) $ZnCl_2$ (B) $CdCl_2$ (C) $CoCl_2$ (D) $CuCl_2$

Q.65 Which of the following statement is correct?
(A) Fe^{2+} gives brown colour with ammonium thiocyanate.
(B) Fe^{2+} gives blue precipitate with potassium ferricyanide.
(C) Fe^{3+} gives brown colour with potassium ferricyanide.
(D) Fe^{3+} gives red colour with potassium ferrocyanide.

Q.66 Which metal salt gives a violet coloured bead in the borax bead test?
(A) Fe^{2+} (B) Ni^{2+} (C) Co^{2+} (D) Mn^{2+}

Q.67 Which of the following gives a precipitate with $Pb(NO_3)_2$ but not with $Ba(NO_3)_2$?
(A) Sodium chloride (B) Sodium acetate
(C) Sodium nitrate (D) Sodium hydrogen phosphate

Q.68 Which of the following is soluble in yellow ammonium sulphide?
(A) CuS (B) CdS (C) SnS (D) PbS

Q.69 A chloride dissolves appreciably in cold water. When placed on a platinum wire in Bunsen flame no distinctive colour is noticed, the cation would be:
(A) Mg^{2+} (B) Ba^{2+} (C) Pb^{2+} (D) Ca^{2+}

Q.70 A white salt is readily soluble in water and gives a colourless solution with a pH of about 9. The salt could be:
(A) NH_4NO_3 (B) CH_3COONa (C) CH_3COONH_4 (D) $CaCO_3$

Q.71 An element (X) forms compounds of the formula XCl_3, X_2O_5 and Ca_3X_2, but does not form XCl_5. Which of the following is the element X?
(A) B (B) Al (C) N (D) P

Q.72 A white sodium salt dissolves readily in water to give a solution which is neutral to litmus. When silver nitrate solution is added to the solution, a white precipitate is obtained which does not dissolve in dil. HNO_3. The anion could be:
(A) CO_3^{2-} (B) Cl^{-} (C) SO_4^{2-} (D) S^{2-}

Q.73 A mixture of two salts is not water soluble but dissolves completely in dil HCl to form a colourless solution. The mixture could be:
(A) $AgNO_3$ and KBr (B) $BaCO_3$ and ZnS (C) $FeCl_3$ and $CaCO_3$ (D) $Mn(NO_3)_2$ and $MgSO_4$

Q.74 Three separate samples of a solution of a single salt gave these results. One formed a white precipitate with excess of ammonia solution, one formed a white precipitate with dil NaCl solution and one formed a black precipitate with H_2S. The salt could be:
(A) $AgNO_3$ (B) $Pb(NO_3)_2$ (C) $Hg(NO_3)_2$ (D) $MnSO_4$

Q.75 Which one of the following ionic species will impart colour to an aqueous solution?
(A) Ti^{4+} (B)Cu^{+} (C) Zn^{2+} (D)Cr^{3+}

Q.76 When a substance A reacts with water it produces a combustible gas B and a solution of substance C in water. When another substance D reacts with this solution of C, it also produces the same gas B on warming but D can produce gas B on reaction with dilute sulphuric acid at room temperature. A imparts a deep golden yellow colour a smokeless flame to Bunsen burner. A, B, C and D respectively are:
(A) Na, H_2, NaOH, Zn (B) K, H_2, KOH, Al
(C) Ca, H_2, $Ca(OH)_2$, Sn (D) CaC_2, C_2H_2, $Ca(OH)_2$, Fe

Q.77 Which is not dissolved by dil HCl?
(A) ZnS (B) MnS (C) $BaSO_3$ (D) $BaSO_4$

Q.78 The brown ring test for NO_2^- and NO_3^- is due to the formation of complex ion with formula:
(A) $[Fe(H_2O)_6]^{2+}$ (B) $[Fe(NO)(CN)_5]^{2-}$
(C) $[Fe(H_2O)_5(NO)]^{2+}$ (D) $[Fe(H_2O)(NO)_5]^{2+}$

Q.79 In Nessler's reagents, the ion present is:
(A) HgI^{2-} (B) HgI_4^{2-} (C) Hg^{+} (D) Hg^{2+}

Q.80 The cations present in slightly acidic solution are Fe^{3+}, Zn^{2+} and Cu^{2+}. The reagent which when added in excess to this solution would identify and separte Fe^{3+} in one step is:
(A) 2 M HCl (B) 6 M NH_3 (C) 6 M NaOH (D) H_2S gas

Q.81 Which of the following leaves no residue on heating?
(A) $Pb(NO_3)_2$ (B) NH_4NO_3 (C) $Cu(NO_3)_2$ (D) $NaNO_3$

Q.82 When I_2 is passed through KCl, KF, KBr :
(A) Cl_2 and Br_2 are evolved (B) Cl_2 is evolved
(C) Cl_2, F_2 and Br_2 are evolved (D) None of these

Q.83 In the separation of Cu^{2+} and Cd^{2+} in 2nd group qualitative analysis of cations tetrammine copper (II) sulphate and tetrammine cadmium (II) sulphate react with KCN to form the corresponding cyano complexes. Which one of the following pairs of the complexes and their relative stability enables the separation of Cu^{2+} and Cd^{2+}?
(A) $K_3[Cu(CN)_4]$ more stable and $K_2[Cd(CN)_4]$ less stable.
(B) $K_2[Cu(CN)_4]$ less stable and $K_2[Cd(CN)_4]$ more stable.
(C) $K_2[Cu(CN)_4]$ more stable and $K_2[Cd(CN)_4]$ less stable.
(D) $K_3[Cu(CN)_4]$ less stable and $K_2[Cd(CN)_4]$ more stable.

Q.84 Which one has the minimum solubility product?
(A) AgCl (B) $AlCl_3$ (C) $BaCl_2$ (D) NH_4Cl

Q.85 Which of the following sulphate is insoluble in water?
(A) $CuSO_4$ (B) $CdSO_4$ (C) $PbSO_4$ (D) $Bi_2(SO_4)_3$

Q.86 A metal X on heating in nitrogen gas gives Y.Y. on treatment with H_2O gives a colourless gas which when passed through $CuSO_4$ solution gives a blue colour Y is:
(A) $Mg(NO_3)_2$ (B) Mg_3N_2 (C) NH_3 (D) MgO

Q.87 Which of the following gives blood red colour with KCNS?
(A) Cu^{2+} (B) Fe^{3+} (C) Al^{3+} (D) Zn^{2+}

Q.88 Which of the following is insoluble in excess of NaOH?
(A) $Al(OH)_3$ (B) $Cr(OH)_3$ (C) $Fe(OH)_3$ (D) $Zn(OH)_2$

Q.89 In the borax bead test of Co^{2+}, the blue colour of bead is due to the formation of:
(A) B_2O_3 (B) Co_3B_2 (C) $Co(BO_2)_2$ (D) CoO

Q.90 Mercurous ion is represented as:
(A) Hg_2^{2+} (B) Hg^{2+} (C) $Hg + Hg^{2+}$ (D) Hg_2^{+}

Q.91 The metal ion which is precipitated when H_2S is passed with HCl:
(A) Zn^{2+} (B) Ni^{2+} (C) Cd^{2+} (D) Mn^{2+}

Q.92 Which of the following is not a preliminary test used to detect ions:
(A) borax bead test (B) flame test (C) brown ring test (D) cobalt nitrate test

Q.93 Which one of the following metal sulphides has maximum solubility in water?
(A) HgS, $K_{sp} = 10^{-54}$ (B) CdS, $K_{sp} = 10^{-30}$ (C) FeS, $K_{sp} = 10^{-20}$ (D) ZnS, $K_{sp} = 10^{-22}$

Q.94 The compound formed in the borax bead test of Cu^{2+} ion in oxidising flame is:
(A) Cu (B) $CuBO_2$ (C) $Cu(BO_2)_2$ (D) None of these

Q.95 A gas 'X' is passed through water to form a saturated solution. The aqueous solution on treatment with $AgNO_3$ gives a white precipitate. The saturated aqueous solution also dissolves magnesium ribbon with evolution of a colourless gas Y. Identify X and Y:
(A) $X = CO_2$, $Y = Cl_2$ (B) $X = Cl_2$, $Y = CO_2$
(C) $X = Cl_2$, $Y = H_2$ (D) $X = H_2$, $Y = Cl_2$

Q.96 Read of the following statements and choose the correct code w.r.t true(T) and false(F).
(I) manganese salts give a violet borax bead test in reducing flame
(II) from a mixed precipitate of AgCl and AgI, ammonia solution dissolves only AgCl
(III) ferric ions give a deep green precipitate, on adding potassium ferrocyanide solution
(IV) on boiling the solution having K^+, Ca^{2+} and HCO_3^- we get a precipitate of $K_2Ca(CO_3)_2$
(A) TTFF (B) FTFT (C) FTFF (D) TTFT

Q.97 Identify the correct order of solubility of Na_2S, CuS and ZnS in aqueous medium is:
(A) $CuS > ZnS > Na_2S$ (B) $ZnS > Na_2S > CuS$
(C) $Na_2S > CuS > ZnS$ (D) $Na_2S > ZnS > CuS$

Q.98 When H_2S gas is passed through the HCl containing aqueous solution of $CuCl_2$, $HgCl_2$, $BiCl_3$ and $CoCl_2$, it does not precipitate out:
(A) CuS (B) HgS (C) Bi_2S_3 (D) CoS

Q.99 Mark the correct statement:
(A) I group basic radicals precipitate as chlorides
(B) IV group basic radicals precipitates as sulphides.
(C) V group basic radicals precipitates as carbonates.
(D) All the above statement are correct.

Q.100 Potassium chromate solution is added to an aqueous solution of a metal chloride. The precipitate thus obtained are insoluble in acetic acid. These are subjected to flame test, the colour of the flame is:
(A) Lilac (B) Apple green (C) Crimson red (D) Golden yellow

Q.101 The species present in solution when CO_2 is dissolved in water are
(A) $CO_2, H_2CO_3, HCO_3^-, CO_3^{2-}$ (B) H_2CO_3, CO_3^{2-}
(C) CO_3^{2-}, HCO_3^- (D) CO_2, H_2CO_3

Q.102 $MgSO_4$ on reaction with NH_4OH and Na_2HPO_4 forms a white crystalline precipitate. What is its formula?
(A) $Mg(NH_4)PO_4$ (B) $Mg_3(PO_4)_2$ (C) $MgCl_2 \cdot MgSO_4$ (D) $MgSO_4$

ANSWER KEY

Q.1	A	Q.2	B	Q.3	B	Q.4	B
Q.5	D	Q.6	B	Q.7	C	Q.8	B
Q.9	A	Q.10	C	Q.11	A	Q.12	B
Q.13	C	Q.14	B	Q.15	A	Q.16	D
Q.17	C	Q.18	D	Q.19	D	Q.20	B
Q.21	B	Q.22	A	Q.23	C	Q.24	C
Q.25	B	Q.26	B	Q.27	D	Q.28	B
Q.29	B	Q.30	B	Q.31	B	Q.32	D
Q.33	C	Q.34	D	Q.35	D	Q.36	A
Q.37	D	Q.38	B	Q.39	D	Q.40	C
Q.41	B	Q.42	D	Q.43	D	Q.44	C
Q.45	B	Q.46	D	Q.47	B	Q.48	D
Q.49	A	Q.50	D	Q.51	B	Q.52	C
Q.53	A	Q.54	D	Q.55	B	Q.56	A
Q.57	C	Q.58	A	Q.59	B	Q.60	A
Q.61	A	Q.62	D	Q.63	B	Q.64	A, C
Q.65	B, C	Q.66	D	Q.67	A	Q.68	C
Q.69	A	Q.70	B	Q.71	C	Q.72	B
Q.73	B	Q.74	B	Q.75	D	Q.76	A
Q.77	D	Q.78	C	Q.79	B	Q.80	B
Q.81	B	Q.82	D	Q.83	A	Q.84	A
Q.85	C	Q.86	B	Q.87	B	Q.88	C
Q.89	C	Q.90	A	Q.91	C	Q.92	C
Q.93	C	Q.94	C	Q.95	C	Q.96	C
Q.97	D	Q.98	D	Q.99	D	Q.100	B
Q.101	A	Q.102	A				